AHRQ Health Information Technology Portfolio’s 2010 Annual Report (with Project Summaries)

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Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Health Information Technology (IT) Portfolio, sponsors a variety of contracts, grants, and cooperative agreements that examine the impact of health IT implementation and use on quality, safety, and other important health care outcomes. This annual report features 121 grant summaries and 59 contract summaries of AHRQ-managed health projects, as well as a summary of activities in the Health IT Portfolio in 2010.

AHRQ is most grateful to its contractors and grantees for their ongoing provision of timely, informative reports and their participation in this initiative to generate project summaries for calendar-year 2010.

We welcome comments on the utility of the summary of the Health IT Portfolio provided in this report and of the 180 Web-based project summaries. Comments may be sent by mail to Vera Rosenthal: Agency for Healthcare Research and Quality, 540 Gaither Road, Rockville, MD 20850, or by e-mail to Vera.Rosenthal@AHRQ.hhs.gov.

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<td>Accelerating Change and Transformation in Organizations and Networks</td>
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<td>AHRQ</td>
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Executive Summary

Research funded by the Agency for Healthcare Research and Quality (AHRQ) Health Information Technology (IT) Portfolio continues to contribute to efforts for improving health care nationwide by demonstrating health IT practices in various health care settings. The results present evidence on how health IT can ensure that medical information is available to appropriate individuals, in an understandable and actionable format, where and when it is needed. These projects generate evidence and insight that facilitate successful design, implementation, and use of health IT, and examine the impact of health IT use on changes in quality, safety, and improved health care outcomes.

To support its broad mission of improving the quality of health care for all Americans, the Agency has focused its health IT initiatives on the following three goals:

• Improve health care decisionmaking.
• Support patient-centered care.
• Improve medication management.

The projects funded through the Health IT Portfolio are conducted in real care delivery settings and identify the practical issues of implementing health IT to:

• Help clinicians provide safe, high quality health care.
• Put the patient at the center of health care.
• Inform the effective implementation of health IT, especially in underserved and under resourced areas.
• Evaluate costs and benefits of health IT.

The Health IT Portfolio works collaboratively with the other AHRQ Centers and Portfolios, as well as other Federal and outside partners.

Report Purpose

This Annual Report is designed to disseminate information on the research areas and progress at both the portfolio and project levels. The Portfolio is summarized by a number of broad categories of projects, including: Health IT Portfolio strategic goals, AHRQ business goals, funding mechanisms, geographic distribution, and lifetime funding as of 2010. The report also describes activities that took place throughout the year and synthesizes challenges, outputs, and successes of the 180 active projects. In addition, as part of the report, an individual project summary for each of the 121 grants and 59 contracts provides an overview of the project’s long term objectives, status updates of the specific aims and objectives, and updates on completed or ongoing project activities. Lastly, the report also highlights the dissemination activities of the projects and the AHRQ Health IT team.

Report Organization and Availability

The report and individual project summaries are available as easy-to-access Web-based documents through the AHRQ-funded project search tool on the National Resource Center (NRC) Web site. The NRC
provides a platform to support outreach and delivery of information from AHRQ and to share expertise across the multidisciplinary fields that are engaged in critical aspects of health IT implementation and research. Users of the Web site can search for project summaries, project-related news, and project publications and can identify projects based on several categories, including type of technology, care setting, or target population.

2010 Annual Report Highlights

Projects represent a diverse range of technologies and care settings, and are geographically dispersed across the United States, including organizations in 36 States and the District of Columbia. The lifetime funding for these grants and contracts is $103.6 million and $71.8 million, respectively.

The AHRQ Health IT Portfolio staff, grantees, and contractors accomplished a variety of activities in 2010 that include:

• Completion of three of the six contracts supporting AHRQ’s 5-year State and Regional Demonstrations in Health Information Technology, which support data sharing and exchange activities aimed at improving health care on a State or regional level and examine characteristics of health information organizations.

• Conclusion of the Transforming Healthcare Quality Through Information Technology (THQIT) grant implementation program, which demonstrated AHRQ’s proactive focus on health IT implementation among rural hospitals and community-based health care settings.

• AHRQ’s Annual Health IT Grantee and Contractor Meeting, held June 2-4 in Washington, D.C., which provided project officers, grantees, and contractors opportunities to gather and learn about the latest research in health IT.

• Synthesis and dissemination activities, by way of presentations at major conferences and meetings, marketing project results through press releases and newsletters, publications, and the NRC Web site.

The activities and achievements of the AHRQ Health IT Portfolio provide important contributions to the field of health IT. This research provides answers to the questions of how best to implement the technology and information on the expected patient outcomes. Evidence gaps, long an issue in health IT, are closing as a direct result of this funded work. The Portfolio’s body of research represents some of the most important sources of evidence as to the impact of technology on improving quality, safety, effectiveness, and efficiency of health care. AHRQ’s Health IT Portfolio team hopes that this work will serve as a catalyst for further research and collaborations across the research community in this field.
I. Introduction

The Agency for Healthcare Research and Quality (AHRQ) has developed the 2010 Health Information Technology Portfolio-Funded Annual Report to disseminate information on the Health Information Technology (IT) Portfolio. This report includes information related to the overall state of the Health IT Portfolio and projects funded by the Portfolio. As part of this effort, individual summaries were developed for the 180 “active” projects that were directly funded by the AHRQ Health IT Portfolio. For the purpose of this report, “active” is defined as ongoing for any time in calendar year 2010. The Health IT Portfolio is summarized by a number of broad categories of projects, including Health IT Portfolio strategic goals, AHRQ business goals, funding mechanisms, geographic distribution, and lifetime funding as of 2010. In addition, the report highlights the dissemination activities of the projects and the AHRQ Health IT team.

In order to provide the public with easy-to-access information, the report and individual project summaries are available as Web-based documents through the AHRQ-funded project search tool at the National Resource Center (NRC) Web site. Users of the Web site can search for project summaries, project-related news, and project publications and can use multiple categories, including type of technology, care setting, and target population, to search for projects.
II. Background

A. Offices and Centers

AHRQ, part of the U.S. Department of Health and Human Services (DHHS), is the lead agency charged with supporting research designed to improve the quality of health care, reduce its cost, and broaden access to essential services. AHRQ’s wide array of research brings practical, science-based information to medical practitioners, consumers, and other health care purchasers. The Agency is comprised of nine major offices and centers:

• **Center for Delivery, Organization, and Markets (CDOM):** CDOM is a locus of expertise and leadership for research on health care markets, delivery systems, and organizations.

• **Center for Financing, Access, and Cost Trends (CFACT):** CFACT conducts, supports, and manages studies of the cost and financing of health care, access to health care services, and related trends. CFACT’s studies and data development activities support policy and behavioral research by providing health care leaders and policymakers with information and tools to improve decisions on health care financing, access, coverage, and cost.

• **Center for Outcomes and Evidence (COE):** COE conducts and supports research and assessment of health care practices, technologies, processes, and systems.

• **Center for Primary Care, Prevention, and Clinical Partnerships (CP3):** CP3 expands the knowledge base for clinical providers and patients and ensures the translation of new knowledge and systems improvement into primary care practices. CP3 supports and conducts research to improve the access, effectiveness, and quality of primary and preventive health care services.

• **Center for Quality Improvement and Patient Safety (CQuIPS):** CQuIPS improves the quality and safety of all Americans through strategic partnerships and collaborations with stakeholders across the health care system to implement evidence-based practices.

• **Office of Communications and Knowledge Transfer (OCKT):** OCKT promotes the communication of information to both internal and external customers. It designs, develops, implements, and manages programs for disseminating and implementing the results of Agency activities that have the goal of changing audience behavior.

• **Office of the Director (OD):** OD directs the research, research training programs, and dissemination activities of AHRQ to ensure the achievement of strategic objectives.

• **Office of Extramural Research, Education, and Priority Populations (OEREP):** OEREP directs the scientific review process for grants and Small Business Innovation Research contracts, manages Agency research training programs, evaluates the scientific contribution of proposed and ongoing research, demonstrations, and evaluations, and supports and conducts health services research on priority populations.

• **Office of Performance, Accountability, Resources, and Technology (OPART):** OPART directs and coordinates Agency-wide program planning and evaluation activities and administrative operations.

B. Portfolios

In addition to the offices and centers, AHRQ supports a series of interrelated health services research programs that individually and
collectively seek to improve the quality, safety, efficiency, and effectiveness of health care for all Americans. In 2010, all funded projects were organized into six AHRQ portfolios: Health IT, Comparative Effectiveness, Innovations and Emerging Issues, Patient Safety Research, Prevention and Care Management, and Value Research.

- **Health IT**: The primary focus of this portfolio is to identify challenges to health IT adoption and use, solutions and best practices for making health IT work, and tools that will help hospitals and clinicians successfully incorporate new health IT.

- **Comparative Effectiveness**: The goal of this portfolio is to support high-quality research to help patients, health care providers (including nurses, doctors, and other clinicians), and policymakers to make evidence-based health decisions.

- **Innovations and Emerging Issues**: This portfolio focuses on identifying and supporting novel research that spans a diverse array of disciplines and has the potential to accelerate improvements in the organization, delivery, and management of health care.

- **Patient Safety Research**: The primary focus of this portfolio is to produce research on the scope and impact of medical errors, the root causes of threats to patient safety, and effective ways to make system-level changes to help prevent errors.

- **Prevention and Care Management**: The objective of this portfolio is to translate evidence-based knowledge into current recommendations for clinical preventive services that are implemented as part of routine clinical practice to improve the health of all Americans, and to research approaches to improve care and reduce disparities for common chronic conditions such as diabetes, asthma, and heart disease.

- **Value Research**: This portfolio aims to facilitate research related to the Value-Driven Healthcare Initiative and the Health Insurance Decision Tool, which provides an integrated set of decision tools to assist States in the development of innovative programs that are consistent with the President’s goal to provide basic health insurance at an affordable price.

To view funding opportunities across the AHRQ Portfolios:

- Go to [AHRQ's homepage](#)
- Select “Funding Opportunities,” located on the left side menu

**The Health IT Portfolio**

P. Jon White, M.D., Director of the Health IT Portfolio, works with a core team of 10 employees. Additional AHRQ staff, including staff from the previously described offices and centers, serve as program officials to support the Portfolio’s activities. Health IT staff members also work collaboratively with staff from other AHRQ offices and portfolios, particularly OCKT, to disseminate information from various health IT endeavors.
The Health IT Portfolio strives to fund and develop the best evidence about health IT adoption and use, solutions, and best practices for making health IT work, and tools that will help hospitals and clinicians successfully incorporate new information technology. To be effective, health IT must be appropriately designed, evaluated, implemented, and used. Interoperable health IT infrastructure has the potential to lower costs, reduce medical errors, improve the quality of care, and provide patients and physicians with new ways to communicate. The Health IT Portfolio also aims, through evidence-based research, to elucidate and disseminate information about the opportunities and challenges related to health IT development, implementation, and adoption.

The AHRQ Health IT Portfolio accomplished a variety of activities in 2010 including:

- Completion of three of the six multi-year State and Regional Demonstrations (SRD) in Health Information Technology contracts. A report prepared by RTI International, Lessons Learned from AHRQ’s State and Regional Demonstrations in Health Information Technology, describes the experiences of all the SRD contracts.

- Conclusion of the 118 “Transforming Healthcare Quality through Information Technology (THQIT)” grants. Through a contract with Mathematica Policy Research, AHRQ is surveying the THQIT grantees and synthesizing the evidence and lessons learned from the program. As part of this work, eight case summaries were developed, all of which represent the positive potential of a diverse set of technologies and applications. The summaries also point to some issues and challenges that must be addressed to realize the potential more broadly.

- Development of a summary report by the Center for Quality and Productivity Improvement at the University of Wisconsin-Madison, Incorporating Health IT into Workflow Redesign, synthesizing existing research and evidence related to the impact of health IT on workflow in outpatient settings.

- Hosting of the 2010 AHRQ Health IT Grantee and Contractor Conference June 2 through June 4 in Washington, D.C. This meeting was an opportunity for AHRQ health IT project officers, grantees, and contractors to gather together and learn about the latest research in health IT, share lessons learned, and build off each others’ work. This meeting also provided grantees and contractors with the opportunity to share their preliminary research findings and any tools that may be helpful to others.

Throughout the year, members of the Health IT Portfolio participated in and spoke at various conferences and meetings including:

- The AHRQ 2010 Annual Conference: Better Care, Better Health: Delivering on Quality for All Americans in September 2010.

- The Academy Health Annual Research Meeting in June 2010.

For more information on these activities, please see Section IV Dissemination.

Portfolio staff also partnered with Federal and private organizations to co-sponsor conferences, provide funding for projects, and share information. Partners included the Health Resources and Services Administration (HRSA), the Indian Health Service (IHS), the Centers for Medicare & Medicaid Services (CMS), Kaiser Permanente, the Commonwealth Fund, and the Robert Wood Johnson Foundation.

Through one of these partnerships, members of the Health IT team also served as program officials for American Recovery and Reinvestment Act (ARRA) contracts funded by the Office of the National Coordinator (ONC), helping with projects designed to improve quality of health IT and advance the concept of meaningful use. In collaboration with ONC, AHRQ is developing the national Health Information Technology Research Center (HITRC) using the NRC as a contracting mechanism. The purposes of the HITRC are to:

- Provide a forum for the exchange of knowledge and experience; accelerate the transfer of lessons learned from existing public and private sector initiatives, including those currently receiving Federal financial support.
- Assemble, analyze, and widely disseminate evidence and experience related to the adoption, implementation, and effective use of health IT that allows for the electronic exchange and use of health information.
- Provide technical assistance for the establishment and evaluation of regional and local health information networks to facilitate the electronic exchange of information across health care settings and improve the quality of health care.
- Provide technical assistance for the development and dissemination of solutions to barriers to the exchange of electronic health information, and learn about effective strategies to adopt and utilize health IT in medically underserved communities.

As of October 2010, there were 13 task orders awarded through the HITRC initiative.

C. Project Classification

Each of the Health IT Portfolio-funded grants and contracts is categorized into one of three health IT strategic goals, and one of three AHRQ business goals. These goals are listed below, along with examples of projects from the Health IT Portfolio that illustrate various efforts toward achieving those goals.

Health IT Strategic Goals

- **Improved Decisionmaking:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.
The *Guidelines into Decision Support (GLIDES)* project, led by Dr. Richard Shiffman (Contract Number 290-08-10011), represents a study that has improved decisionmaking as its strategic goal. The team is developing, implementing, and evaluating projects that will advance the understanding of how best to incorporate clinical decision support (CDS) into health care delivery. By incorporating CDS into electronic health records (EHRs) and assessing the benefits and drawbacks, a set of recommended methods will be developed to help clinical organizations across the country efficiently and effectively implement CDS.

- **Patient-Centered Care (PCC) or Health Information Exchange (HIE):** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Improving Health Care Quality through Health Information Technology for People with Intellectual Disability**, led by Dr. James Howard Rimmer (Grant Number R21 HS 018766), exemplifies a project with PCC as its strategic goal. The project addresses the lack of care continuity for people with intellectual disabilities (ID) by adapting and testing a personal health record (PHR) to specifically meet the needs of people with ID. The PHR-ID will enable longitudinal data on people with ID to be accessed by caregivers and health care providers, as well as functionality to provide alerts for action items established in a patient’s care plan.

The *HIE and Ambulatory Test Utilization* project is led by Dr. Stephen Ross (Grant Number R21 HS 018749) and illustrates a project with the HIE strategic goal. The project is looking at whether adoption of a community-wide HIE is associated with a reduction in utilization of laboratory and radiology testing. By conducting a retrospective pre-post comparison of providers, the study team is assessing whether or not the regional HIE system helped doctors provide more efficient medical care.

- **Medication Management:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

The *Computer Assisted Medication and Patient Information Interface* project, led by Dr. David Ziemer (Grant Number R21 HS 018236), is an example of the medication management strategic goal. The project team is developing and testing a tool to improve and standardize the flow of information between patients with type 2 diabetes and providers, with the aim to improve treatment outcomes and reduce complications. The provider interface will support medication management functions, including correcting incoming medication data, entering new drug regimens, printing medication instructions, and producing a daily medication schedule for patients.

**AHRQ Business Goals**

- **Knowledge Creation:** Projects that: 1) collect data on and produce measures of the quality, safety, effectiveness, and efficiency of American health care and health care systems or 2) foster the development of knowledge about improving health care, health care systems, and capacity (e.g., training, placement).
The **Improving Patient Access and Patient-Clinician Continuity Through Panel Redesign** project, led by Dr. Hari Balasubramanian (Grant Number R03 HS 018795), demonstrates an example of the knowledge creation business goal. Using patient appointment data, physician panel sizes, and case mix from primary care databases, the project is studying how group practices can dynamically manage physician panels to improve timeliness of access and continuity. The project team will develop a quantitative decision support system to assist clinicians and practice managers.

**Synthesis and Dissemination:** Projects that: 1) create tools and synthesis of evidence including knowledge, measure, and data or 2) disseminate information to multiple stakeholders to improve the system.

The **Enabling Medication Management Through Utilization of Health Information Technology** project, led by Dr. Ann McKibbon (Contract Number 290-07-100601-5), is a case example of the synthesis and dissemination business goal. An evidence report was developed regarding the impact of health IT on all phases of the medication management process, including prescribing and ordering; order communication, dispensing, administration, and monitoring; as well as education and reconciliation. The report identified gaps in the literature and provided recommendations for future research. Quality and safety considerations included: 1) accurate and timely prescribing of medication in response to a specific patient, 2) correct first-fill and refill dispensing of medications, 3) appropriate administering of medication, and 4) patients taking the pharmaceutical treatment regimen as prescribed.

**Implementation and Use:** Projects that partner with stakeholders to implement proven strategies for health care improvement, including empowering Americans to be proactive patients.

The **Virtual Patient Advocate to Reduce Ambulatory Adverse Drug Events** project, (Grant Number R18 HS 017196), led by Dr. Brian Jack, illustrates the implementation and use business goal. This project developed the Virtual Patient Advocate (VPA), a computerized, animated character that emulates the face-to-face conversational behavior of an empathic provider in providing health education, advice on monitoring and self-care, and assessment of medication dosing and adherence. Following hospital discharge, patients have access to the VPA via a Web portal, and are encouraged to use it before their first visit with their primary care physician. The randomized controlled trial began in August 2010 to test the concept of the VPA.

**D. Funding Mechanisms**

There are a variety of mechanisms for funding projects that further the goals of the Health IT Portfolio. Each award mechanism specifies the content, format, and timeline for deliverables, including periodic reporting requirements for completion of milestones and budget updates. Grants, cooperative agreements, contracts, and interagency agreements are four of the common mechanisms that AHRQ applies to carry out a wide variety of directed health services research and administrative activities. Description of each is provided below.

**Grants and Cooperative Agreements**

Grants provide money, property, or other direct assistance to allow eligible entities to carry
out an approved project or activity in support of a public purpose that does not directly benefit the Government, with no substantial programmatic involvement with the recipient during performance of the financially assisted activities. Cooperative agreements are used when there will be substantial Federal programmatic involvement, meaning that program staff will collaborate or participate in project or program activities as specified in the Notice of Grant Award. For the purpose of this report, the term “grant” is used to include both grants and cooperative agreements.

Proposals for grants and cooperative agreements are submitted in response to AHRQ’s issuance of a funding opportunity announcement (FOA). One-time FOAs are known as request for applications (RFAs), and recurring FOAs are known as program announcements (PAs). There have been three major funding waves that have focused on health IT: 1) Transforming Health Care Quality through Information Technology RFAs, 2) Ambulatory Safety and Quality RFAs, and most recently 3) Health IT-Oriented Program Announcements. All of the grants in the first two categories had been awarded through now-closed, one-time RFAs. The funding initiatives are outlined below and described in more detail in Appendix A.

- **Transforming Health Care Quality through Information Technology (THQIT) RFAs.** The THQIT projects, awarded in 2004 and 2005, supported different aspects of organizational and community-wide health IT implementation-related activities, elucidated various stakeholders’ perspectives, and/or demonstrated the value of health IT implementation and use, particularly in rural hospitals and community-based health care settings. All of the grants awarded through the THQIT RFAs are now closed.

- **Ambulatory Safety and Quality (ASQ) RFAs.** The ASQ initiative awarded grants in 2007 and 2008 to support projects that focused on patient-centered care, quality measurement, and clinical management of complex patients. The ASQ initiative funded grants through the following four RFAs:
  - **Enabling Patient-Centered Care (PCC) Through Health IT RFA (HS-07-007):** Designed to investigate novel methods or evaluate existing strategies for using health IT to create or enhance patient-centered models of care in the ambulatory setting.
  - **Improving Quality Through Clinician Use of Health IT (IQHIT) RFA (HS-07-006):** Designed to investigate novel methods or evaluate existing strategies for clinician use of health IT in ambulatory settings to improve outcomes through more effective CDS, medication management, or care delivery.
  - **Enabling Quality Measurement (EQM) Through Health IT RFA (HS-07-002):** Intended to develop safety and quality measures in ambulatory care settings, automate quality measurement, demonstrate the ability of electronic data systems, expand potential safety and quality measures, and demonstrate improved ability to export data for reporting performance on measures and improvement.

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2. Researchers interested in AHRQ funding opportunities should periodically check the AHRQ Web site for updates, and the NIH grant notice page for the most recent information on the peer review process, funding criteria, and application forms.
In April 2011, AHRQ published two new health IT-related FOAs to supplement its existing FOAs and special emphasis notice (SEN). These funding opportunities are designed to fund basic health IT research and fill gaps in the field that will lead to improved design of health IT systems.

- **The Understanding Clinical Information Needs and Health Care Decision Making Processes in the Context of Health Information Technology (IT) (R01) FOA** will fund research aimed at elucidating the nature of cognition, task distribution, and work in health care delivery settings. Research projects funded under this FOA will address current knowledge gaps regarding the understanding of health care providers’ information needs and health care decisionmaking processes.

- **The Understanding User Needs and Context to Inform Consumer Health Information Technology (IT) Design (R01) FOA** will fund projects that will help build a knowledge base about consumers’ personal health information management needs and practices and related design principles. Project results should lead to a better understanding of user needs and how their findings will impact consumer health IT design.

- **Improving Management of Individuals with Complex Healthcare Needs through Health IT RFA (HS-08-002), also referred to as “Management of Complex Patients” (MCP):** Serves to demonstrate the ability of health IT to assist clinicians, practices, systems, and patients and families in improving the quality and safety of care delivery for individuals with complex health care needs in ambulatory care settings, particularly in high-risk care transitions.

- **Health IT-Oriented PAs.** In September 2008, AHRQ issued three FOAs designed to help achieve measurable and sustained improvements in quality and safety of health care in ambulatory settings and in transitions of care through the development, implementation, and use of health IT. The funding opportunities (R03, R21, and R18) offer applicants incremental support for the conduct of increasingly complex health IT research projects. New proposals for the R03 and R21 FOAs are still being accepted by AHRQ, while the R18 FOA closed in May 2011. The first grants of these FOAs were awarded in September 2009. The following are general overviews about each of the FOAs.

  - **Small Research Grants to Improve Healthcare Quality through Health IT (R03) (PAR-08-268):** Supports different types of small research studies including:
    1) pilot and feasibility or self-contained health IT research projects, 2) secondary data analysis of health IT research, and 3) economic prospective or retrospective analyses of health IT implementation.

  - **Exploratory and Developmental Grant to Improve Health Care Quality through Health IT (R21) (PAR-08-269):** Provides funding for health IT exploratory and developmental research projects that support the conduct of short-term preparatory, pilot, or feasibility studies. The R21 grants are intended to be more comprehensive and broader in scope than the relatively smaller, self-contained health IT research projects supported by the health IT R03 FOA.

  - **Utilizing Health IT to Improve Health Care Quality Grant (R18) (PAR-08-270):** Supports demonstration research grants that study health IT implementation and use to improve the quality, safety,
effectiveness, and efficiency of health care in ambulatory settings and transitions between care settings.

• **Other Health IT-Funded Grants.** The Health IT portfolio funds additional health IT-focused grants, including Career and Dissertation Awards (K01, K08, and R36), Conference Support Awards, Health Services Research (R01) Purpose Awards for ongoing extramural grants, Health Services Research Demonstration and Dissemination Grants (R18), and Centers for Education and Research on Therapeutics (CERTs).

Researchers interested in AHRQ health IT funding opportunities should periodically check the AHRQ Web site for updates:


**Contracts**

A contract is an agreement that is initiated by the Government to, under specified terms, acquire an identifiable product or service. The Health IT Portfolio uses various contract mechanisms to solicit requests for proposals (RFPs), including one-time RFPs and requests for task orders (RFTOs) when a master contract has been issued under an Indefinite Delivery Indefinite Quantity (IDIQ)³. Master contracts are a special type of RFP that are issued to a group of well-qualified contractors who are then eligible to compete for a subsequent series of master contract-issued RFTOs. RFTOs are provided to master contract awardees for a particular program, such as the Primary Care Practice Based Research Networks.

**1. National Resource Center (NRC) for Health IT Contracts.**

There are numerous contracts that support the National Resource Center (NRC) for Health IT. AHRQ initially established NRC contracts in 2004 as a way to communicate and deliver technical assistance to its grantees. AHRQ’s NRC supports the Agency’s mission of developing and disseminating evidence and evidence-based tools on how health IT can improve health care quality, safety, and efficiency. The NRC is a resource for research findings, best practices, lessons learned, and funding opportunities for health IT researchers, implementers, and policymakers.

The NRC plays a pivotal role in supporting AHRQ’s management of the Health IT Portfolio, including: generating and disseminating synthesized reference documents, such as lessons learned and project success stories; conducting a series of national Web conferences; and organizing and posting numerous resources on the NRC Web site. More than 10,000 documents, presentations, articles, and tools are freely available on the NRC Web site. Thirty-two master contractors currently support the diverse needs of the NRC across the following four domains:

• **Domain 1** – Support for Health IT Program Management, Guidance, Assessment, and Planning

• **Domain 2** – Health IT Technical Assistance, Content Development, and Program-Related Projects and Studies

• **Domain 3** – Health IT Dissemination, Communication, and Marketing

³ For the full text of all AHRQ RFPs issued since 2000, see [http://archive.ahrq.gov/fund/contrarch.htm](http://archive.ahrq.gov/fund/contrarch.htm).
• **Domain 4** – Health IT Portal Infrastructure Management and Web Site Design and Usability Support

2. **Health IT Contracts.**

In addition to the NRC, AHRQ funds a variety of knowledge-generating contracts through other mechanisms. The numbers of Health IT Portfolio contracts by contract mechanism are included in Appendix B.

**Interagency Agreements**

Interagency agreements (IAAs) are used to provide to, purchase from, or exchange goods or services with another Federal agency. In 2010, the Health IT Portfolio funded four projects that were managed by other Federal agencies. This report summarizes Health IT Portfolio-sponsored projects managed only by AHRQ.
III. Results and Discussion

Through the 180 projects that comprised AHRQ’s Health IT Portfolio in 2010, the Agency is supporting the development and dissemination of evidence on how health IT can be used to improve the quality, safety, efficiency, and effectiveness of care in a variety of health care settings. This section presents the distribution of grants and contracts active in 2010 by Health IT Portfolio strategic goals, AHRQ business goals, and AHRQ lifetime funding. It also contains information on projects’ spending, status of milestones, and the principal investigator’s (PI’s) history with Federal Grant funding, which is reported by grantees but not by contractors.
A. Health IT Portfolio Active Projects (Grants and Contracts)

By Strategic and Business Goals

Eighty-four projects (31 contracts and 53 grants), or 47 percent of all Health IT Portfolio-sponsored projects in 2010, were assigned the strategic goal of enabling patient-centered care or health information exchange (PCC or HIE) as shown in Figure 1. Sixty-eight projects (24 contracts and 44 grants), or 38 percent of the Portfolio’s projects, had improved decisionmaking as their strategic goal. Twenty-six projects (4 contracts and 22 grants), or 15 percent, focused on medication management as their strategic goal.

The distribution of business goals differs by type of mechanism (grant or contract). Of the 121 grants, 54 (45 percent) focused on implementation and use of health IT. Fifty-four grants (45 percent) focused on knowledge creation. Thirteen grants, or 11 percent, focused on synthesis and dissemination. Among the 59 contracts, 24 (41 percent) focused on synthesis and dissemination, 24 contracts (41 percent) focused on knowledge creation, and 11 contracts (19 percent) focused on implementation and use of health IT.

Figure 1. AHRQ-Sponsored Health IT Grants and Contracts as of 2010, by Strategic and Business Goals*

<table>
<thead>
<tr>
<th>Strategic and Business Goals</th>
<th>Percent of Grants</th>
<th>Percent of Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Grants and Contracts (n=178)</td>
<td>44%</td>
<td>20%</td>
</tr>
<tr>
<td>Medication Management (n=26)</td>
<td>37%</td>
<td>19%</td>
</tr>
<tr>
<td>Patient-Centered Care or Health Information Exchange (n=84)</td>
<td>46%</td>
<td>36%</td>
</tr>
<tr>
<td>Improved Decisionmaking (n=68)</td>
<td>46%</td>
<td>18%</td>
</tr>
</tbody>
</table>

*Two AHRQ Health IT grants do not have strategic goals and are therefore not included in this figure.

4. Two projects (grants) were not assigned a specific Health IT strategic goal.
Geographic Distribution of Active Projects

In 2010, the award recipient project institutions spanned 36 States and the District of Columbia (see Figure 2). One project was awarded to an institution in Ontario, Canada. Massachusetts, with 28, was the State with the highest number of active health IT projects. California, with 17, had the next-highest level of active health IT projects, followed by Maryland with 12, New York with 11, and North Carolina with 9.

Figure 2. Number of Active Projects Sponsored by AHRQ’s Health IT Portfolio as of 2010 (by State)

Note: 179 projects in 36 states plus the District of Columbia. One project in Ontario, Canada, not shown.
B. Grant Terms and Counts

Term of Grants

Maximum project periods for grants are specified in each FOA or PA. All of the Health IT Portfolio-sponsored grants active in 2010 were multi-year grants except for two smaller grants for conference support (R13), one R03 grant, and three Health Services Research Dissertation (R36) grants, which were all 1-year awards.

Grants that are issued under expanded authority\(^5\) are able to request a no-cost extension\(^6\). Requests can be made 1 month before the initial project end-date to extend the project period for as long as 12 months, as long as there are no changes in scope. Grants, including cooperative agreements, that were not issued under expanded authority may request no-cost extensions of up to 12 months. The following list summarizes the number of projects that were operating under a no-cost extension at some point during 2010:

- The two THQIT grants active in 2010 were functioning under a no-cost extension. Both projects ended in January 2010.
- All 15 active EQM grants in 2010 received a no-cost extension; all but two of these grants ended in 2010.

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5. Operating authorities provided to grantees that waive the requirement for agency prior approval for specified actions.

6. An extension of the period of performance beyond the expiration date to allow the principal investigator to finish a project, with no additional cost to the government.
• Among the 24 active IQHIT grants, 18 received 12-month no-cost extensions and will end in 2011. One project received a 3-month no-cost extension and ended in late 2010.
• All but one of the 16 PCC grants received a no-cost extension: 13 projects for 12 months, one project for 6 months, and one project for 3 months.
• Two of the R03 grants were awarded no-cost extensions; one for 12 months, one for 3 months.

Figure 3 shows the status of grants in terms of how many projects that began prior to 2010 concluded or remained ongoing at the year’s end, as well as how many new grants began in 2010. As demonstrated in Figure 3, the majority of the grants (78 projects, or 64 percent), were ongoing through the entire year, 17 grants (14 percent) began, and 26 grants (22 percent) ended.

### Grants: Lifetime AHRQ Funding by Term of Grant and Strategic and Business Goals

Lifetime AHRQ funding refers to the total support (direct plus indirect costs) that AHRQ obligates to a grant during the project period, as long as the grantee’s performance indicates continuation of the grant.

Among the 119 grants assigned a strategic goal and active in 2010, total AHRQ funding equaled $103.4 million. Of these grants, 53 represented the most-commonly assigned strategic goal, enabling PCC or HIE, and represent $48.0 million in lifetime AHRQ funding (see Table 1). This is not surprising considering that two FOAs (HS-08-002 and HS-07-007) funded projects to support health IT implementation and use for patients with complex medical needs and to support PCC. Twenty-two grants were assigned the goal of medication management, totaling $21.4 million in lifetime AHRQ funding, and

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Table 1. Counts and Lifetime AHRQ Funding for Active Health IT Grants as of 2010, by Term of Grant and Strategic Goals*

<table>
<thead>
<tr>
<th>Grant Term</th>
<th>Medication Management</th>
<th>Patient-Centered Care or Health Information Exchange</th>
<th>Improved Decisionmaking</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Projects</td>
<td>AHRQ Funding**</td>
<td>Number of Projects</td>
<td>AHRQ Funding**</td>
</tr>
<tr>
<td>Active prior to 2010; concluded in 2010</td>
<td>3</td>
<td>$3.6</td>
<td>7</td>
<td>$5.5</td>
</tr>
<tr>
<td>Active prior to 2010; ongoing</td>
<td>17</td>
<td>$17.4</td>
<td>39</td>
<td>$40.2</td>
</tr>
<tr>
<td>Began in 2010; ongoing</td>
<td>2</td>
<td>$0.5</td>
<td>7</td>
<td>$2.3</td>
</tr>
<tr>
<td>Total</td>
<td>22 (18%)</td>
<td>$21.4 (21%)</td>
<td>53 (45%)</td>
<td>$48.0 (46%)</td>
</tr>
</tbody>
</table>

*The two AHRQ Health IT grants without strategic goals are not included in this table.

**In millions of dollars. Due to rounding, total AHRQ funding values may not equal the sum of their respective columns or rows.
the 44 grants with improved decisionmaking as the goal accounted for $34.0 million in lifetime AHRQ funding.

The distribution of AHRQ lifetime funding by business and strategic goals is shown in Figure 4. Grants that focused on the business goals of implementation and use of health IT and knowledge creation dominated the portfolio in terms of number of grants, each representing 45 percent of the portfolio, with 54 grants assigned to each. However, total lifetime funding for grants assigned the implementation and use of health IT goal is, at $57 million, higher than funding for knowledge creation grants, at $36.4 million. Knowledge creation remains a growing focus of the Health IT Portfolio and continues to receive increased grant funding.

While only 9 percent (11/119) of grants have the business goal of dissemination and synthesis, totaling $10.0 million, this number does not

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**Figure 4. AHRQ Lifetime Funding for Health IT Grants as of 2010, by Business and Strategic Goals**

*Two AHRQ Health IT grants do not have strategic goals and are therefore not included in this figure.

** Total AHRQ Lifetime Funding values may not equal the sum of their data series components due to rounding.
indicate an undervaluing of dissemination or synthesis activities. On the contrary, dissemination of results is a requirement specified in each FOA and notice of grant award. Each grantee is encouraged to update the NRC on a quarterly basis on the status of the grant, to post materials on the NRC Web site, to notify AHRQ’s OCKT when and where manuscripts are to be published, and to participate in the annual AHRQ-sponsored meeting.

Grantees’ Most Recent Self-Reported Project and Spending Status

In an effort to understand grantees’ experience and performance in reaching their specific project milestones, most AHRQ Health IT Portfolio grantees report their project progress and challenges to AHRQ’s Research Reporting System (ARRS) on a quarterly basis. AHRQ is monitoring the milestone progress and spending patterns of grantees both within and across

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**Results and Discussion**

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Figure 5. AHRQ-Sponsored Health IT Grantees’ Self-Reported* Status Regarding Overall Goals as of 2010, by Funding Opportunity Announcement

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*For the most recently submitted quarter in 2010
**Seventeen AHRQ Health IT grants are not required to submit quarterly reports and are therefore not included in the totals. Two grants ended in January 2010 and thus did not report status in 2010.
funding mechanisms in order to understand factors that influence project process and spending. The ARRS reporting requirements include self-reported categorical variables for grantees to indicate the extent to which they are on track in reaching overall milestones and spending plans. Since these self-characterizations are reported quarterly, variation may occur from quarter to quarter for a given project. AHRQ recognizes that through the course of the grant process unexpected delays—such as loss of key personnel; additional time to ensure the institutional review board’s (IRB’s) approval of plans for protection of human subjects; or delays in software development, installation, or interfacing with pre-existing software—may temporarily delay achievement of research milestones and upend spending plans. Training (K-awards and research dissertation grants [R-36]) and other Health IT grants (e.g., conference support grants) do not report progress on a quarterly basis and are therefore not included in the totals.

The breakdown of AHRQ-sponsored health IT grantees’ last self-reported overall goal status7 in 2010 (see Figure 5) is:

- 22 percent (22/102) reported progress as ‘completely on track.’
- 52 percent (53/102) reported progress as ‘mostly on track.’
- 25 percent (25/102) reported progress as ‘on track in some respects but not others.’
- 2 percent (2/102) reported progress as ‘meeting many milestones is stalled.’
- 0 percent (0/102) reported progress as ‘stalled across project.’

In general, grantees report a high level of attaining grant-specified milestones with approximately 75 percent of grantees reporting project progress as ‘mostly on track’ or ‘completely on track. During quarterly calls with John Snow, Inc, through an NRC task order contract focusing on monitoring and reporting on Health IT Portfolio-funded projects, none of the grantees reported problems that might lead to complete project failure. All grantees with reported delays in achieving specific milestones identified alternative solutions to overcoming challenges or anticipated that they would request a no-cost extension to complete the project.

The breakdown of AHRQ-sponsored health IT grantees’ last self-reported budget in 2010 (see Figure 6)8 is:

- 9 percent (9/102) were ‘significantly underspent,’ by more than 20 percent.
- 29 percent (30/102) were ‘somewhat underspent,’ by approximately 5 to 20 percent.
- 61 percent (62/102) were ‘spending roughly on target’.
- 1 percent (1/102) were ‘somewhat overspent,’ by approximately 5 to 20 percent.
- 0 percent (0/102) were ‘significantly overspent,’ by more than 20 percent.

More than 60 percent of grantees reported their spending as on target in their most recent 2010 quarterly report, while 38 percent underspent budgeted AHRQ funds. Several of these grantees reported that underspending was a result of delays in implementation of the project (e.g., hiring staff, awaiting IRB approval), or technology development. Notably, grantees appear to be sound fiscal managers of their grant funding, as evidenced by the lack of reports of significant overspending.

Reporting these spending levels through ARRS is voluntary. However, if grantees are to receive approval for continuation of funding for each

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7. Two grants ended in January 2010 and thus did not report status in 2010.
8. Numbers may not add up due to rounding.
C. Challenges Across Projects

Many of the health IT grants experienced various challenges. Three challenges, in particular, that consistently ranked high during each quarter of 2010 related to: 1) key personnel (n=37), 2) sample or subjects (n=45), or 3) technology (n=33) (not listed in order of significance). While the categorization of challenges often fell into one of these three groups, the specific scenarios behind each of these challenges were as diverse as the grantees themselves. Below are some examples of challenges that were reported, followed by a discussion on how AHRQ-sponsored technical assistance (TA) was provided to help to overcome them.
Examples of Challenges Reported in 2010

- Lack of available technological personnel needed to build and support a particular intervention, causing the study team to seek alternate solutions to provide the same functionality and deliverables so as not to compromise the integrity of the study protocol.

- Relatively low study participant recruitment rates due to the design of the intervention endpoint placing a high degree of burden on participants. The study team had to alter the intervention endpoint to make recruitment more feasible while upholding the ability to assess the intervention and the study outcomes.

- Lack of commercially-available solutions for tracking and reporting medication compliance, leaving the study team to rely on prescription claims data to infer when prescriptions are filled or picked up. However, prescription claims data are not consistently and readily available. The project was challenged to identify strategies for analyzing prescription claims data and adjusting the study data accordingly if data erosion was evident.

D. Technical Assistance

AHRQ provides TA to health IT grantees to help them achieve their research and grant objectives and disseminate their findings to advance the field. AHRQ’s TA program develops and provides a wide range of resources and tools to help grantees complete projects on time and expedite dissemination of findings that may transform clinical practice.

AHRQ funds TA through Booz Allen Hamilton (BAH), one of the NRC contractors, to respond to challenges facing grantees, particularly issues that may slow a project’s progress. TA is provided as grantee-specific, one-on-one TA, or multi-grantee TA. Below are examples of TA categories and types requested in 2010.

Grantee-Specific TA

The purpose of one-on-one grantee-specific TA is to ensure the progress and on-time completion of health IT-funded grant projects. Specifically, grantee-specific TA fosters the timely delivery of discrete assistance so that individual grantees’ challenges and barriers to the conduct of health IT research are addressed. TA can be requested by a PI, another project team member, or by AHRQ staff on the project’s behalf. The TA provider contacts the project team to gather followup information and determine whether their request is in scope for TA. In 2010, there were two requests that were out of scope; the remaining 33 TA requests in 2010 were considered in scope. The frequency, request type, and an example for each are listed in Table 2.

Multi-Grantee TA

Multi-grantee TA leverages open-forum meetings and peer-to-peer teleconferences to allow grantees to compare experiences and address common challenges, mitigating approaches, proven successful research methods, and other pertinent considerations. Multi-grantee TA meetings are held via Webinar teleconferences or in-person meetings. These meetings often include outside experts who provide insight on a specific topic. The peer-to-peer teleconferences allow grantees with similar projects to share their experiences without formal presentations (see Table 3).

Other Multi-Grantee TA Formats

Since August 2010, the AHRQ Health IT TA Listserv has served as an opt-in discussion platform where grantees can collaborate, share information, and form virtual topical
### Table 2. 2010 One-on-One Technical Assistance Activities*

<table>
<thead>
<tr>
<th>2010 TA Requests</th>
<th>TA Category</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>Technology</td>
<td>Request dialogue with other grantees concerning EHR and HIE implementation in the behavioral health setting, specifically involving privacy and security issues and information exchange among providers.</td>
</tr>
<tr>
<td>8</td>
<td>Methodology</td>
<td>Request for assistance in identifying survey instruments that could be used as a reference or modified to help develop utilization and provider satisfaction questionnaires. The objective is to survey providers before and after use of system to ascertain how helpful the system was.</td>
</tr>
<tr>
<td>4</td>
<td>Recruitment</td>
<td>Request for information regarding best practices and effective ways of providing remuneration for physicians participating in a surveys.</td>
</tr>
<tr>
<td>3</td>
<td>Privacy/Security/Protection of Human Subjects</td>
<td>Request for information regarding social networking sites (e.g., Facebook) and issues of consent, how to write the consent process, and how to approach the IRB process.</td>
</tr>
<tr>
<td>2</td>
<td>Grants Administration</td>
<td>Request for review of first ARRS quarterly report.</td>
</tr>
<tr>
<td>2</td>
<td>Other</td>
<td>Request for a list of U.S. Preventive Services Task Force (USPSTF) recommendations by grade (e.g., A, B, C, D, I), rather than by disease or topic. The grantee needed the recommendations to weigh the evidence versus the impact and feasibility of service delivery, cost effectiveness, and risk/benefit ratio, in order to map those back to their own measures.</td>
</tr>
<tr>
<td>2</td>
<td>Analysis Protocols</td>
<td>Request for assistance with identifying the analysis plan and SAS program for the October 6, 2008, version of the Consumer Assessment of Healthcare Providers and Systems (CAHPS) Survey. The grant project team initiated the survey in July of 2009 and used this version of CAHPS. The instructions and analysis program, available on the AHRQ Web site, is from the newest version, October 8, 2009, and was therefore not applicable to the version that the team used.</td>
</tr>
<tr>
<td>1</td>
<td>Dissemination</td>
<td>Request for general support with dissemination process.</td>
</tr>
</tbody>
</table>

*Other categories of available TA include engagement and quality. Because there were no requests for these categories in 2010, they are not listed in the table.*
communities. In addition to the listserv, AHRQ created an FAQ document that addresses grants management and administration topics and is a resource for TA providers when working with grantees on administrative-related issues.

### E. Grantee Lifetime Funding and Outputs

**Principal Investigators**

Grants and cooperative agreements are awarded to an institution rather than to a specific PI. However, the PI is the designee within the recipient organization and is responsible for the scientific, technical, and programmatic aspects, and day-to-day management of the project. Among the 121 health IT grants active in 2010, there were 113 distinct PIs. Eight PIs had two AHRQ-sponsored health IT grants active in 2010. Information about PI grantee award histories is based on data from the Information for Management Planning, Analysis, and Coordination (IMPAC) II database. This grantee award database is maintained by the National Institutes of Health (NIH) and is used by agencies within the Department of Health and Human Services.

Previous Career or Training Grant: Among the 113 unique PIs who had an active health IT-sponsored grant in 2010, 30 (27 percent) were recipients of a previously-funded career award (K-award) or training grant (T-32) to enhance their research abilities. These previous grants were funded by a range of Federal agencies including HRSA, AHRQ, the Centers for Disease Control and Prevention (CDC), and NIH. Among these 30 PIs, 15 had received one or more K-awards, 13 had received a T-32 training grant, and two PIs had received both a K-award and a

### Table 3. 2010 Multi-Grantee Specific Technical Assistance Activities

<table>
<thead>
<tr>
<th>Multi-Grantee TA Category</th>
<th>2010 Topics and Links to Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer-to-Peer Teleconference</td>
<td>Medication Reconciliation, Personal Health Records (PHR)</td>
</tr>
<tr>
<td>In-Person Meeting</td>
<td>AHRQ Annual Health IT Grantee and Contractor Meeting</td>
</tr>
</tbody>
</table>
Table 4. Distribution of First-Time Grant Principal Investigators, by Funding Opportunity Announcement

<table>
<thead>
<tr>
<th>Percentage of First-Time PIs</th>
<th>Transforming Healthcare Quality Through Health IT (THQIT) FOAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% (1/2)</td>
<td>RFA-HS-05-013 Limited Competition for AHRQ THQIT Implementation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of First-Time PIs</th>
<th>Ambulatory Safety and Quality (ASQ) FOAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>44% (7/16)</td>
<td>RFA-HS-07-007 ASQ Enabling Patient-Centered Care Through Health IT</td>
</tr>
<tr>
<td>25% (6/24)</td>
<td>RFA-HS-07-006 ASQ Improving Quality Through Clinician Use of Health IT</td>
</tr>
<tr>
<td>20% (3/15)</td>
<td>RFA-HS-07-002 ASQ Enabling Quality Measure Through Health IT</td>
</tr>
<tr>
<td>8% (1/12)</td>
<td>RFA-HS-08-002 ASQ Improving Management of Individuals with Complex Healthcare Needs through Health IT</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of First-Time PIs</th>
<th>Health IT-Oriented PAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>57% (4/7)</td>
<td>PAR-HS-08-268 Small Research Grant to Improve Health Care Quality Through Health IT (R03)</td>
</tr>
<tr>
<td>19% (3/16)</td>
<td>PAR-HS-08-270 Utilizing Health IT to Improve Health Care Quality (R18)</td>
</tr>
<tr>
<td>67% (8/12)</td>
<td>PAR-HS-08-269 Exploratory and Developmental Grant to Improve Health Care Quality through Health IT (R21)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of First-Time PIs</th>
<th>Training and Career</th>
</tr>
</thead>
<tbody>
<tr>
<td>58% (7/12)</td>
<td>NOT-HS-08-014 Special Emphasis Notice: Career Development (K01, K02, K08) and Dissertation (R36) Grants Focused on Health Information Technology (IT)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Percentage of First-Time PIs</th>
<th>Conference Support and Other FOAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>50% (1/2)</td>
<td>PAR-09-231 Small Grant Program for Conference Support (R13)</td>
</tr>
<tr>
<td>0% (0/1)</td>
<td>RFA-HS-07-004 Centers for Education and Research on Therapeutics (CERTs) (U18)</td>
</tr>
<tr>
<td>100% (1/1)</td>
<td>PAR-09-257 AHRQ Grant Program for Large Conference Support (R13) and (U13)</td>
</tr>
<tr>
<td>0% (0/1)</td>
<td>PAR-09-070 AHRQ Health Services Research (R01)</td>
</tr>
</tbody>
</table>
T-32 training grant. In addition to the work they are conducting on their career or training grants, many of the K-award and training grantees are mentored by more experienced investigators and may also collaborate on another AHRQ-funded research grant. For example, Dr. Guilherme Del Fiol, an active K-award grantee who leads the project *Context-Aware Knowledge Delivery into Electronic Health Records*, is also a team member of the IQHIT project *Improving Quality through Decision Support for Evidence-Based Pharmacotherapy*.

Previous Federal Grant: The percentage of first-time grantees across the ASQ FOAs varied. One out of the 12 PIs (8 percent) awarded an Improving Management of Individuals with Complex Healthcare Needs through Health IT grant was a first-time PI. Among the other three ASQ FOAs, three PIs (20 percent) leading Enabling Quality Measure through Health IT grants were first-time PIs, six first-time PIs (25 percent) were awarded Improving Quality through Clinician Use of Health IT grants, and seven first-time PIs (44 percent) were awarded Enabling Patient-Centered Care through Health IT grants.

Eight of the 12 PIs (67 percent) who had an Exploratory and Developmental Grant to Improve Health Care Quality through Health Information Technology (R21) grant were new PIs. Three (19 percent) of the 16 PIs who had Utilizing Health Information Technology to Improve Health Care Quality (R18) grants were new. Four (57 percent) of the seven PIs who had a Small Research Grant to Improve Health Care Quality Through Health Information Technology (R03) were new PIs. See Table 4 for more detail.

**Outputs**

Grantees submit information about tools, products, and other outputs, such as publications

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**Table 5. Tools, Products, and Other Outputs from 2010**

<table>
<thead>
<tr>
<th>Type of Tool/Output</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presentation</td>
<td>82</td>
</tr>
<tr>
<td>Poster</td>
<td>60</td>
</tr>
<tr>
<td>Publication (peer reviewed)</td>
<td>27</td>
</tr>
<tr>
<td>Other</td>
<td>23</td>
</tr>
<tr>
<td>Internal Documents</td>
<td>20</td>
</tr>
<tr>
<td>Tool</td>
<td>15</td>
</tr>
<tr>
<td>Publication (non-peer reviewed)</td>
<td>13</td>
</tr>
<tr>
<td>Surveys</td>
<td>12</td>
</tr>
<tr>
<td>Data Collection Tools</td>
<td>11</td>
</tr>
<tr>
<td>Manuscript</td>
<td>8*</td>
</tr>
<tr>
<td>Tool/Product</td>
<td>4</td>
</tr>
<tr>
<td>Measures/Specifications</td>
<td>3</td>
</tr>
<tr>
<td>Product</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>280</strong></td>
</tr>
</tbody>
</table>

*Including manuscripts submitted, but not yet accepted for publication.*
or presentations, related to or developed from their projects. During 2010, grantees reported a total of 280 outputs, the majority of which (82) were presentations. Grantee outputs are categorized in Table 5.

The outputs categorized as “other” included news articles, abstracts submitted for conferences, and outputs such as a Web-based video demonstrating a recent version of a system interface.

F. Contracts

In 2010, the Health IT Portfolio had 59 active contracts with cumulative AHRQ lifetime funding of $71.8 million. These contracts enabled individual projects to address a defined, predetermined need. Each contract was assigned one of three Health IT Portfolio strategic goals and one of three AHRQ business goals.

Initial project duration is specified in each contract, and some contracts have a provision to support additional option years. The start dates and duration of the 59 project-specific contracts active in 2010 vary from 1 year to more than 5 years.

As shown in Table 6, a greater number of contracts (n=31) and larger amount of contract funding ($43.8 million) are associated with the Health IT Portfolio strategic goal of PCC or HIE than the other two strategic goal categories combined (n=28 and $28.0 million). This is in part because the six SRDs for HIE contracts, which collectively have an AHRQ lifetime budget of $31.4 million, and are assigned the strategic goal of PCC or HIE. There were 24 contracts with a Health IT Portfolio strategic aim of improved decision making, and a total of $25.8 million funding. Health IT Portfolio support for medication management is lower than other categories, at $2.2 million for four contracts.

For business goals, equal numbers of contracts had a business goal of synthesis and

### Table 6. Counts and Lifetime AHRQ Funding for Health IT Contracts as of 2010, by Health IT Portfolio Strategic Goal and AHRQ Business Goal

<table>
<thead>
<tr>
<th>AHRQ Business Goal</th>
<th>Medication Management</th>
<th>Patient-Centered Care or Health Information Exchange</th>
<th>Improved Decisionmaking</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number of Projects (%)</td>
<td>Number of Projects (%)</td>
<td>AHRQ Funding* (%)</td>
<td>Number of Projects (%)</td>
</tr>
<tr>
<td>Implementation and Use</td>
<td>1</td>
<td>6</td>
<td>$1.0</td>
<td>4</td>
</tr>
<tr>
<td>Knowledge Creation</td>
<td>2</td>
<td>13</td>
<td>$0.8</td>
<td>9</td>
</tr>
<tr>
<td>Synthesis and Dissemination</td>
<td>1</td>
<td>12</td>
<td>$0.4</td>
<td>11</td>
</tr>
<tr>
<td>Total</td>
<td>4 (7%)</td>
<td>31 (53%)</td>
<td>$2.2 (3%)</td>
<td>24 (41%)</td>
</tr>
</tbody>
</table>

*In millions of dollars. Due to rounding, total AHRQ funding values may not equal the sum of their respective columns or rows.
dissemination or knowledge creation (24 each, 41 percent), followed by implementation and use (n=11, 19 percent).

Both of the 2-year projects for the Clinical Decision Support (CDS) Initiative (funded at $6.2 million and $6.3 million) had an AHRQ business goal of knowledge creation. Excluding the larger contracts for SRD and CDS, AHRQ lifetime funding ranged from $50,000 to $4.7 million for the remaining 51 contracts.

G. Project Successes

As illustrated in this report, AHRQ funds various types of health IT projects. These projects address important gaps in the research and relevant literature about health IT implementation and use, particularly its impact on quality, safety, and improved health care outcomes, and the applicability of those findings to other health care settings. This section provides several examples of AHRQ-funded projects that were active in 2010 and demonstrate the range of the Health IT Portfolio’s success.

Patients Take a Bite of Prevention Apple with Web-Based Interactive Personal Health Records:

Dr. Alex Krist is leading a series of AHRQ-funded projects, each building upon the previous to show: 1) the development and effect of an interactive PHR (IPHR) tool on patient outcomes, 2) the ability of the tool to integrate with multiple and varied EHRs and health care settings, and 3) how the tool can be integrated into the workflow of all practices and be made available to all practice patients. The first study, An Interactive Preventive Health Record (IPHR) to Promote Patient-Centered Care, demonstrated the tool’s efficacy in improved outcomes in the delivery of preventive services. The followup studies, Promoting Use of an Integrated Personal Health Record for Prevention and Using Health Information Technology to Improve Health Care Quality in Primary Care Practices and in Transitions between Care Settings, are helping to demonstrate the tool’s ability to be adopted and utilized in a range of primary care settings. This latter focus, which includes engaging providers in the redesign of their workflow and with patients in the management of their own care, will provide important insight into further and more widespread adoption.

Individualized, Multi-Media Materials in Spanish and English Help Seniors Manage Medications and Communicate with Clinician Teams:

In order to address challenges that older adults may have with adherence to their medication regimens, Dr. Kate Lapane and a group of researchers developed DVD segments on topics such as insomnia, depression, heart failure, and diabetes as part of the Tailored DVD to Improve Medication Management for Low-Literate Elderly Patients. In the process of developing the DVDs, researchers learned that older adults often take their medications in ways other than prescribed; are unaware of the danger of taking medications incorrectly; and assume that their
primary care provider knows about all of their medications, including those prescribed by other caregivers. Viewers found the DVDs to be informative and enjoyable, and the majority reported that the DVD content was highly relevant to their situations.

**Time, Effort, and Infrastructure Costs to Use EHRs:**

Dr. Neil Fleming’s project, *Impact of Health Information Technology on Primary Care Workflow and Financial Measures*, sought to reduce the uncertainty about startup and maintenance costs of EHR implementation, as well as the impact of implementation on provider productivity. The project included an economic analysis to identify the costs of planning, implementing, and maintaining an ambulatory EHR for primary care practices. The study team found that implementing an EHR at a five-physician practice cost an estimated $162,000, with $85,500 in maintenance expenses during the first year. The team also found increased expenses and decreased productivity during the 6 months following EHR implementation. However, by 12 months after the EHR was in place, productivity was close to pre-EHR levels.

**Toolkit Available for Assessing the Impact of Health IT on Workflow in Provider Offices:**

Dr. Pascale Carayon’s project, *Incorporating Health Information Technology Into Workflow Redesign*, gathered information related to workflow changes in a variety of health IT systems and care settings. The team addressed the negative technological impacts on quality and safety, which can result when health IT is not designed to fit the specific context of a given practice or a patient population. The study determined that all practices benefit from a clear understanding of how clinical and administrative tasks are performed, and how these processes might change with the introduction of health IT. Among practices that have implemented health IT, some workflow effects, such as an initial increased workload for physicians, seem to be universal. Dr. Carayon and her team synthesized their own and existing research to develop a toolkit to help small- and medium-sized practices assess their workflow to gain a better understanding how health IT may impact it, and to minimize drawbacks in the process.

**Pediatric Medication Prescribing Made Simpler and Safer:**

As part of the *STEPStools: Developing Web Services for Safe Pediatric Dosing* grant, Dr. Kevin Johnson and his team developed a tool to help pediatricians prescribe the appropriate medication dose for children based on their age and development. STEPStools is improving the quality and safety of medications for children and includes recommendations for appropriate doses of 90 percent of the medicines most-commonly prescribed to children that require weight-based dosing. In addition to the immediate safety impact, there are several secondary benefits of correct dosing and helping kids get healthy faster, including fewer days home from school for children, and fewer days home from work for their caregiving parents. This Web-based tool is compatible with many electronic prescribing tools. The project team is working with the American Academy of Pediatrics to disseminate the tool.
Projects Pave Way for Health Information Exchange Efforts in the U.S:

Six State and regional HIE demonstration projects were conducted to identify and support data sharing and exchange activities aimed at improving health care for patients and populations. These States and their respective health information organizations (HIOs) were:

- Colorado: Colorado Regional Health Information Organization (CORHIO)
- Delaware: Delaware Health Information Network (DHIN)
- Indiana: Indiana Network for Patient Care (INPC)
- Rhode Island: currentcare
- Tennessee: Mid-South e-Health Alliance (MSeHA), project management team from Vanderbilt University Center for Better Health
- Utah: Utah Health Information Network (UHIN)

Over the course of these 5-year contracts, HIOs demonstrated different approaches to establishing HIE based on the needs of their community, care-delivery infrastructure, and laws within their individual States or regions. While the HIOs varied in their approaches, they nonetheless paved the way for other organizations. With few established HIOs in existence at the time, these six contracts provided an opportunity to study how these organizations are planned, implemented, and sustained. In the process of developing and implementing these diverse systems, these HIOs learned several key lessons about success and changed the HIE landscape.

- Each HIE is unique: there is no “one-size fits all.”
- A range of stakeholders must be engaged for HIE to be successful.

- Establishing a sound business plan is critical.
- Securing funding early in the planning process allows greater flexibility.
- Patient identification and matching is a core challenge in HIE.
- Technology development is influenced by policy and operational considerations.
- Architecture should be based on the needs of the community.
- Initial focus on clinical settings with high impact leads to early wins.

Lessons learned from the SRD contracts were disseminated in a report prepared by AFYA, Inc., Lessons Learned from AHRQ’s State and Regional Demonstrations in Health Information Technology. More information on the SRDs is available on the SRD Web site.

These projects are a sample of the diverse research that the Health IT Portfolio funds. They demonstrate the positive impact of health IT implementation and use on changes in quality, safety, and improved health care outcomes. Individual success stories for some of these projects have been developed and are available as featured projects on the NRC Web site.
IV. Dissemination

An important aspect of AHRQ's Health IT Portfolio is its mission to disseminate the information generated by its programs and partners. This section reflects the range of synthesis and dissemination activities by reviewing the presentation and outreach activities of Health IT Portfolio members and OCKT, as well as numerous NRC-sponsored activities.

There are five complementary means for the AHRQ-led dissemination of health IT information:

- Presentations by members of the Health IT Portfolio
- AHRQ's Annual Health IT Grantee and Contractor Meeting
- AHRQ's Annual Conference
- NRC for Health IT
- AHRQ's Office of Communications and Knowledge Transfer

A. Presentations by Members of the Health IT Portfolio

Members of the Health IT Portfolio made numerous presentations to various stakeholder groups and venues, including: the Healthcare Information and Management Systems Society Annual Meeting in March 2010; AcademyHealth's Annual Research Meeting in June 2010; the National Regional Extension Centers and Health Information Exchange Summit West in October 2010; and co-sponsored meetings with other Federal agencies including the Centers for Medicare & Medicaid Services, the Food and Drug Administration, the Office of the National Coordinator (ONC) for Health IT, and the Veterans Health Administration.

B. AHRQ's Annual Health IT Grantee and Contractor Meeting

AHRQ hosted the 2010 Annual Health IT Grantee and Contractor Meeting from June 2 to 4 in Washington, DC9. The meeting was an opportunity for AHRQ health IT project officers, grantees, and contractors to gather together to learn about the latest research in health IT, share lessons learned, and build on each other’s work. This meeting was also an opportunity for grantees and contractors to share preliminary research findings and tools with each other. A total of 282 grantees, contractors, and other project staff attended this 3-day meeting.

The meeting agenda included a variety of plenary, panel, and keynote presentations. A sample of the presentations is summarized below:

- Dr. James Kahn’s presentation, “A Randomized Study of the Personal Health Record in the Public Health Setting,” emphasized that as PHRs become more common, there is increased opportunity to promote self-management as a means to improve health. The presentation outlined the randomized, controlled trial that Dr. Kahn and his team are conducting to evaluate clinical outcomes for PHR versus non-PHR users. Preliminary data indicate a range of computer skills among participants who were enthusiastic about seeing their personal health information in one place.

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C. AHRQ’s Annual Conference

AHRQ hosted its fourth annual conference from September 27 to 29, 2010, in Bethesda, MD\(^\text{10}\). The conference, titled “Better Care, Better Health: Delivering on Quality for All Americans,” showcased leading authorities in health services research and policy.

The conference featured presentations in five major tracks:

1. Transforming Health Care Delivery
2. Developing New Patient Care Models
3. Strengthening Preventive Care and Reducing Health Disparities
4. Improving Quality and Patient Safety
5. Measuring and Reporting on Provider and System Performance

As part of the first track, Health IT team members reviewed the Health IT Portfolio’s accomplishments and activities of the past year and described activities for the coming year, including collaborations with other Federal programs. Other health IT-related presentations included information on how AHRQ supported the health IT Regional Extension Centers (RECs) by, in partnership with ONC, establishing the National HITRC to gather and share best practices with the RECs. AHRQ also delivered a presentation on the SRDs, that included lessons learned and ways that new and emerging HIE initiatives might leverage those lessons.

In addition, there were several presentations given by grantees and contractors, including the following:

- Dr. Joseph Finkelstein’s presentation, “Enabling Patient-Centered Care through Health IT: A Systematic Review of the Evidence,” synthesized the impact of health IT applications on facilitating the

\(^{10}\) AHRQ 2010 Annual Conference. Agency for Healthcare Research and Quality.
provision of patient-centered care based on a literature review of 322 relevant articles. The review indicated that a positive effect has been demonstrated on the major types of outcomes. However, most studies did not use a comprehensive approach to developing health IT to support patient-centered care. In addition, high heterogeneity of outcomes limited comparative evaluation.

- Dr. Jerry Osheroff presented “Structuring Care Recommendations for Clinical Decision Support,” which described a project that sought to accelerate widespread uptake of well-accepted, evidence-based patient care recommendations into clinical information systems via CDS. The project included an assessment of stakeholders’ prior work and needs, conversion of guideline recommendations into structure logic statements, and dissemination of processes, lessons, and results. This project stimulated conversation among key CDS players, cultivated synergies between CDS and performance measurement, and illustrated the concept of formal logic structures to support CDS-enabled health care performance improvement.

- Dr. Lynne Nemeth delivered a presentation entitled “Increasing the Effective Use of Electronic Standing Orders.” Standing orders may improve efficiencies and increase preventive services when used with EHR reminder systems in primary care. In order to demonstrate this effect, a pilot demonstration project was conducted in eight primary care practices in eight States. Six of the eight practices successfully adopted the electronic standing order protocol and demonstrated meaningful improvement in care across study measures, including immunizations, mammogram rates, and screening for diabetes and osteoporosis. Technical competence and leadership were identified as key factors to optimally adapt and use the system.

D. National Resource Center (NRC) for Health IT Web Site

The NRC Web site (www.healthit.ahrq.gov) is a central means for the dissemination of findings from AHRQ’s health IT projects. Additionally, it is a platform to support outreach and delivery of information from AHRQ and to share expertise across the multidisciplinary fields that are engaged in critical aspects of health IT implementation and research.

The majority of material posted on the NRC Web site is generated by Health IT Portfolio-sponsored grantees or contractors. Information on the NRC Web site is organized by categories of information.

- Events: Past and upcoming health IT-related events sponsored by AHRQ are listed on the “Events” page of the Web site. Links to resources, such as meeting agendas and presentations, are provided as applicable. The list of events includes activities such as National Web Teleconferences that feature interactive presentations by experts in a particular field of health IT, and other important health IT activities.
• **AHRQ-Funded Projects:** Detailed information about each health IT-funded project is available on the Web site. Users may search for projects by geography, health care setting, type of health IT technology, target population, and principal investigator.

• **Health IT Tools and Resources:** AHRQ and its community of contractors and grantees have developed tools to help health care organizations plan, implement, and evaluate health IT. These freely available tools describe and recommend strategies for addressing some of the common challenges that organizations encounter when working with health IT systems. Tools include the Rural Health IT Adoption Toolkit, the Health IT Literacy Guide, the Health IT Survey Compendium, the Health IT Evaluation Measures: Quick Reference Guides, and the Health IT Bibliography.

• **Knowledge Library:** The Knowledge Library contains both evidenced-based and theoretical content gathered by health IT experts. This page provides information on a variety of health IT-related topics produced by both AHRQ-funded experts and provided by professional societies and nonprofit organizations.

• **Funding Opportunities:** AHRQ lists open FOAs for health IT and provides links to other Federal grant programs through NIH, the Department of Defense, the National Science Foundation, CDC, and the White House Official Grant Catalog, as well as links to funding Web pages for the Robert Wood Johnson Foundation, California Healthcare Foundation, and the Commonwealth Fund.

**E. AHRQ’s Office of Communications and Knowledge Transfer Dissemination Activities**

OCKT staff plays a critical role in the synthesis and dissemination of findings from the Agency’s health IT research. Below is a summary of OCKT’s marketing and media dissemination activities in 2010 in regard to specific deliverables from AHRQ Health IT Portfolio-funded grant and contract projects.

• **Media Outreach:** In 2010, OCKT issued two press releases on AHRQ-funded health IT research:
  - [AHRQ Study Shows Using Bar-Code Technology with electronic medication administration record (eMAR) Reduces Medication Administration and Transcription Errors, 5/5/10](#)
  - [Innovative Software Cuts Costs and Time for States to Report Hospital Quality Information to the Public, 6/3/10](#)

• **Marketing Outreach:** In 2010, AHRQ conducted marketing outreach to key associations, Federal entities, advocacy groups, policy groups, and other stakeholders to promote relevant findings to the health IT industry. As a result, OCKT sent 48 e-mail announcements to various audiences on topics including:
  - [Innovative Software Cuts Costs and Time for States to Report Hospital Quality Information to the Public, 6/3/10](#)
The report, funded by AHRQ and the National Science Foundation and developed by Professional and Scientific Associates under Contract No. 290-09-00027U, explored the critical intersection of industrial and systems engineering with health care research, and included a special emphasis on the supportive role of health IT.

**Report on Successes in Health IT:** In December 2010, OCKT promoted and disseminated a report titled “Using Health IT: Eight Quality Improvement Stories.” The report, funded by AHRQ and developed by Mathematica Policy Research under Contract No. HHSA 290200900019I, demonstrated how health IT can be used to improve efficiencies in health care delivery, quality of care, and access to care, and highlights the successes of eight AHRQ THQIT-funded projects:

- A network of rural hospitals in Iowa successfully implemented an EHR and simultaneously redesigned many aspects of care delivery. (PI: Donald K. Crandall, Grant Number UC1 HS 015196).
- A group of agencies created a Web-based system to improve access to pediatric health care in rural areas through a medical home. (PI: Gregory W. Bergner, Grant Numbers UC1 HS 016129 and P20 HS 014908).
- Health care organizations and a county government in Oklahoma used a “network of networks” model to develop an easily-replicable, cost-effective HIE framework. (PI: Mark H. Jones, Grant Numbers UC1 HS 016131 and P20 HS 015364).
- Emergency Medical Service agencies used a Web-based quality reporting system and CDS technology to improve the timeliness and quality of care provided to cardiac patients. (PI: Harry P. Selker, Grant Number UC1 HS 015124).
- Telemedicine clinics in New Mexico gave patients with hepatitis C access to high-quality local care. (PI: Sanjeev Arora, Grant Number UC1 HS 015135).
- Reduced use of emergency departments through a telemedicine system to connect schools and child care centers to primary care physicians. (PI: Kenneth M. McConnachie, Grant Number R01 HS 015165).
- A group of nursing homes implemented health IT into long-term care to improve quality and provide lessons learned for using health IT in new settings. (PI: Susan D. Horn, Grant Number UC1 HS 015350).
- The use of lower-cost medications was significantly increased by providing prescribers with real-time information on the relative costs of drugs. (Pl: Joel S. Weissman, Grant Number R01 HS 015175).

**GovDelivery Updates:** AHRQ continued to garner new subscribers for its health IT listserv using the GovDelivery e-mail subscription system. In 2010, AHRQ issued 26 updates on health IT topics to more than 33,000 subscribers, 5,000 of whom joined in 2010. Updates included the following:

- An AHRQ study that shows EHRs can prevent and reduce diagnostic errors.
- An AHRQ study that shows bar-code technology with eMAR reduces medication administration and transcription errors.

**To sign-up to receive AHRQ Health IT News and Information**

- Go to AHRQ homepage
- Select “Subscribe to updates,” located on the lower left corner
- Choose a subscription option
A Web site to provide objective information about medical homes to policymakers and researchers.

- **Media Coverage:** In 2010, the AHRQ Health IT portfolio received media coverage in 107 different media outlets in 425 articles. As a result of media and marketing outreach efforts, AHRQ received broad media coverage from 40 mainstream and trade publications, including the American Journal of Public Health, Forbes.com, and Yahoo! News. Figure 7 below illustrates AHRQ health IT media coverage by type.

- **Blogs:** AHRQ received coverage from five technology and health-care related blogs: Health Affairs, HIStalk, HIStalkPractice, Mobihealthnews, and The Health Care blogs.

- **Podcasts:** AHRQ’s **Healthcare 411** is a news series that features audio podcasts on consumer-oriented and timely topics such as health-care quality, safety, efficiency, and health IT. Weekly, 60-second radiocasts air on more than 1,000 radio stations nationwide and are shared with more than 700 professional organizations. Several podcasts have highlighted results from projects funded through the health IT Portfolio. In 2010, AHRQ issued the following health IT-specific podcast:

  - **Online Health Information:** This podcast, posted on September 22, 2010, provides tips on how to find reliable online sources of health information. The podcast, as well as its transcript, are available for download.
• **Videos:** The AHRQ Health Care Innovations Exchange has created a video series, *AHRQ Health Care Quality: Frontline Innovators on Changing Care, Improving Health*. They feature brief video profiles of six health care professionals sharing human interest stories that illustrate the key elements of their innovations and the impact on the lives of individuals. One of the videos developed, *Remote Visits by Pediatricians for Sick Children at Inner-City and Other Child Care Centers/Schools Reduce Absences and Emergency Department Use*, highlights a Health IT Portfolio funded project: PI: Kenneth M. McConnochie, Grant Number R01 HS 015165.

• **Meeting Exhibits:** In 2010, the AHRQ Health IT Portfolio was promoted at nine annual meetings or conferences, including the American Medical Informatics Association and the Healthcare Information and Management Systems Society. Meetings at which AHRQ health IT information was featured include:
  - American Medical Informatics Association
  - Healthcare Information and Management Systems Society
  - Academy Health
  - American College of Physicians
  - American Public Health Association
  - American Osteopathic Association
  - American Academy of Family Physicians
  - American Academy of Physician Assistants
  - National Forum on Quality Improvement in Health Care

• **E-Newsletters and Research Activities**
  - **AHRQ’s Monthly Research Activities:** *Research Activities (RA)* is AHRQ’s monthly print and online newsletter that features articles and announcements on Agency products and projects and summarizes research findings from AHRQ-supported studies. During 2010, RA had nearly 30,000 print and more than 25,000 electronic subscribers. Health IT-related headlines in 2010 included:
    - Primary care physicians like e-prescribing systems but make little use of their advanced features.
    - E-prescribing has expanded among Massachusetts physicians.
    - Web-based programs help patients with diabetes feel empowered for self-care.
    - Longer use of EHR is not linked to improved quality of care.
    - Hospital discharge software slightly boosts patient and physician satisfaction.
    - Nursing home users of IT start to see benefits.
    - Computer display helps reduce ventilator-associated pneumonia.
    - Drug monitoring may be improved by health IT and clinical pharmacists.

Featured critical topics in health IT are listed below:
- Statement on Certification programs
- Meaningful use and setting standards for EHR incentive programs
- AHRQ and ONC’s Health IT Research Center
- Transitions-in-care Web conference
- AHRQ Web page on consumer health IT applications
- AHRQ CDS podcasts
- AHRQ in the health IT professional literature
• Physicians with EHRs are more able to generate patient registries.
• Health IT improves timely availability of diagnostic information.
• Computerized provider order entry significantly reduces medication errors in an ambulatory setting.
• Physicians support HIE but are concerned about paying monthly fees.
• No additional benefit with remote offsite monitoring of intensive care unit patients.
• E-prescribing with CDS reduces medication errors.
• E-prescribing improves safety but with a small increase in physician time.
• CDS in EHR improves asthma care.
• Use of EHR features is associated with improved primary care measures.
• Regional HIEs must do more to attract small practices.
V. Conclusion

In 2010, work funded through the AHRQ Health IT Portfolio continued to make important contributions to the field of health IT. This research has furthered the evidence base on the impact of technology in health care. Evidence gaps, long an issue in health IT, are closing as a direct result of this work. The portfolio represents an important source of evidence on technology’s ability to improve the quality, safety, effectiveness, and efficiency of health care. Important work has continued in the area of evaluating factors associated with successful implementation and utilization of health IT to inform others interested in adopting health care technology. Projects remain diverse, representing the full range of technologies and care settings, and geography, including organizations in 36 States and the District of Columbia.

2010 also marked the final year for active grants funded through the Transforming Health Care Quality through Information Technology (THQIT) initiatives. The two remaining grants of the 118 funded under these programs in 2004 and 2005 ended in 2010, bringing the funding for this inaugural program to a close. Through THQIT-funded grants, AHRQ proactively focused on health IT implementation among rural hospitals and community-based health care settings, many of which had little or no experience with health IT systems preparation and implementation. First-time and experienced grantees alike displayed a commitment to building integrated communities that support health IT implementation and use. AHRQ continues to disseminate lessons learned from these grants. For example, Mathematica Policy Research, Inc, with support through an NRC Task Order contract, developed eight individual case studies of THQIT grants, representing the positive potential of a diverse set of technologies and applications, and identifying issues and challenges that must be addressed to realize the potential more broadly.

The Health IT Portfolio’s second major grant funding initiative, the Ambulatory Safety and Quality (ASQ) Program, is also moving toward successful completion.

- All 15 of the Enabling Quality Management grants were functioning under a no-cost extension in 2010, with all but two ending in 2010.

- The original grant terms for both the Improving Quality through Clinician Use of Health IT and Enabling Patient Centered Care initiatives were set to end in 2010. However, the majority received no-cost extensions and only eight grants ended.

- The Improving Management of Individuals with Complex Health Care Needs grants, originally funded through 2011, all remain active.

At the close of 2010, there were three open grant PAs and one Special Emphasis Notice (NOT-HS-08-014). The PAs are supporting small research grants on the use of health IT to improve health care outcomes (R03s), exploratory, and developmental grants (R21s), as well as research and demonstration grants (R18s). The Special Emphasis Notice supports both the career development grants (K-awards) and the dissertation awards that serve to support up-and-coming health services researchers and examine how health IT can be used to improve health care quality in an increasingly complex fashion.

In total, 54 projects, including 26 grants and 28 contracts, ended in 2010. Seventeen grants and 10 contracts started in 2010.
2010 was a notable year for the six contracts funded to support State and Regional Demonstration Projects for Health Information Exchange. Originally funded in 2004 and 2005, the first of the projects from this inaugural program came to a close. Three projects ended in 2010, while the remaining three are slated to end in 2011. The goal of these contracts is to identify and support data sharing and exchange activities aimed at improving health care for patients and populations on a State or regional level. When the six contracts awarded, few established HIOs existed, affording an opportunity to study how these organizations are planned for, implemented, and sustained.

The AHRQ Health IT Portfolio staff partnered with Federal and private organizations to co-sponsor conferences, provide funding for projects, and share information. In addition, the Portfolio staff worked closely with OCKT staff to synthesize and disseminate many of the Health IT Portfolio activities during 2010, by way of presentations at major conferences and meetings, and by marketing project results through press releases and newsletters. Grantees and contractors also disseminated information about their projects in publications and on the NRC Web site, as demonstrated by the more than 200 newly reported grantee tools, products, and outputs in 2010.

This report highlights some of the successes and challenges that projects reported in 2010 as they conducted their research. Many of the projects are helping to address important gaps in the research and relevant literature about health IT implementation and its use, particularly in regard to impact on quality, safety, and improved health care outcomes and the potential to translate these findings to other health care settings. Through the NRC, AHRQ provides TA to health IT projects to help them overcome obstacles, achieve their research and grant objectives, and disseminate their findings, including one-on-one TA and Webinars for targeted groups of grantees. In addition to multiple TA Webinars, the AHRQ Health IT Listserv was launched in 2010 to promote peer-to-peer knowledge sharing among grantees and to create a community of experts where topics of shared interest could be discussed.

Individual summaries of project activities and preliminary findings from 2010 are available in the next section of this report VI. Project Summaries, as well as on the NRC Web site. The summaries are an excellent resource for implementers of health IT, prospective research applicants, and others interested in the challenges and successes of health IT implementation and use in terms of research and practical application. They describe the characteristics of successful research projects and PIs’ abilities to adjust and persevere through the real-world challenges and setbacks encountered in health IT implementation, use, and evaluation.
### VI. Project Summaries

Table 7. Grant Summaries (THQIT)

<table>
<thead>
<tr>
<th>Completed in 2010</th>
<th>Principal Investigator</th>
<th>Project Title</th>
<th>Funding Opportunity Announcement</th>
<th>Summary</th>
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<tr>
<td>Yes</td>
<td>Connelly, Donald, MD, PhD</td>
<td>A Community-Shared Clinical Abstract to Improve Care</td>
<td>HS05-013</td>
<td>43</td>
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<tr>
<td>Yes</td>
<td>Lozzio, Carmen B., MD, FACMG</td>
<td>Improving Quality Care for Children with Special Needs</td>
<td>HS05-013</td>
<td>45</td>
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</table>
A Community-Shared Clinical Abstract to Improve Care

Principal Investigator: Connelly, Donald, M.D., Ph.D.
Organization: Fairview Health Services
Mechanism: RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality through Information Technology (THQIT)
Grant Number: UC1 HS 016155
AHRQ Funding Amount: $1,482,674
Summary Status as of: January 2010, Conclusion of Grant

Target Population: Adults, Congestive Heart Failure

Summary: This project seeks to improve continuity of care for emergency department (ED) patients by implementing a health information exchange (HIE) among three health care systems. Handoffs between medical providers are recognized as a potential source of medical error. Such risks are compounded during emergency visits, when patients may use the nearest available ED rather than their usual source of care. The project assesses the effect of providing additional clinical information during care transitions.

The project initially planned to exchange full continuity of care documentation among EDs in three health care systems; however, recent additions to Minnesota privacy law made this goal infeasible. The plan was revised to have ED clerical personnel prepare patient record abstracts from ambulatory care electronic medical record (EMR) systems and make them available to clinicians in the participating EDs.

An observational study of congestive heart failure (CHF) patients at an ED in each health system was conducted to assess the effect of prior information on care quality and efficiency measures. Although project partners are still interested in advancing the HIE model and applying it to the local area, regulatory changes and the early status of the statewide Minnesota Health Information Exchange (MN HIE) delayed electronic exchange of patient record abstracts beyond the timeframe of this project.

Specific Aims:

- Extract and analyze de-identified patient ED visit data from participating facilities in order to determine which populations would be best served by implementation of the HIE. **(Achieved)**
- Evaluate if the existence of prior clinical information accessible in the EMR would diminish information gaps and be associated with better quality and efficiency of care compared to patients for whom such information was not available at the time of the ED visit. **(Achieved)**

2010 Activities: The project team conducted statistical analysis of outcome measures and developed the final report.

Grantee’s Most Recent Self-Reported Quarterly Status (as of January 2010): The MN HIE was conducting a number of pilot studies and was not available before the project’s end date. The contingency plan of creating and evaluating paper-based health summary reports was completed successfully. Overall, at the end of the grant period, progress and spending was roughly on target.
Impact and Findings: The impact of several external factors forced the project team to amend their plans. The EMR vendor common to the three health systems adopted a closed exchange strategy that required customers to agree to an unlimited geographic scope of exchange rather than a regional exchange. Privacy and security concerns about the vendor’s approach limited the health systems’ acceptance until later in 2009. The Minnesota legislature updated privacy regulations to accommodate HIE and to affirm its commitment to a state-based HIE organization; however, these changes led to uncertainty among the legal counsels of the health systems and delayed implementation decisions. Recognizing the need for an exchange organization in Minnesota led to the inception of the MN HIE in late 2007. The project’s executive board committed the project to use the nascent HIE once its communication services became available to avoid developing redundant and temporary communication channels. Finally, the national health information technology (IT) picture dramatically changed over the term of this project. While health IT attained much higher visibility and has substantial Federal financial incentives, the temporal prioritization of HIE has not increased. Rather, meaningful use criteria are being established by the Federal government to drive deployment of health IT functions and have effectively postponed exchange until 2013 and beyond, a full decade after the current project was envisioned. Although national efforts are now bringing about encouraging progress, most of these barriers still remain.

Once it became clear that true exchange was not going to be feasible during the project’s term, the team modified the evaluation plan to focus on two ED patient groups, internal and external, at each of the three participating EDs. Internal patients are those with CHF who already had an electronic clinical record in that health system at the time of their first ED visit in the study period, and external patients are those with no available electronic record. There were 5,166 patients designated as index cases with 3,974 (77 percent) determined to be internal patients. After adjusting for age, sex, race, marital status, and comorbidities, internal patients in one of the settings had fewer orders for laboratory tests and medications while in the ED; lower odds of hospitalization; and if hospitalized, lower odds of mortality than external patients. The study has shown that once multiple barriers to HIE are overcome, an HIE-supported equivalent process can become a valuable adjunct in the care of ED patients.

More detail on the project findings is included in the Dr Connelly’s final report: Connelly 2010 Final Report.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination
### Improving Quality Care for Children with Special Needs

<table>
<thead>
<tr>
<th>Principal Investigator:</th>
<th>Lozzio, Carmen B., M.D., F.A.C.M.G.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization:</td>
<td>University of Tennessee, Knoxville</td>
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<tr>
<td>Mechanism:</td>
<td>RFA: HS05-013: Limited Competition for AHRQ Transforming Health Care Quality Through Information Technology (THQIT)</td>
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<tr>
<td>Grant Number:</td>
<td>UC1 HS 016133</td>
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<tr>
<td>AHRQ Funding Amount:</td>
<td>$1,096,491</td>
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<tr>
<td>Summary Status as of:</td>
<td>January 2010, Conclusion of Grant</td>
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**Target Population:** Children with Special Health Care Needs, Pediatric*

**Summary:** This project developed a secure, Web-based electronic health record (EHR) called the Tennessee Child Health Profile (TN-CHP) to provide comprehensive information on children with special health care needs (CSHCN). The goal of the TN-CHP is to expedite primary diagnosis by making it easier for primary care providers, parents, and legal guardians to access and manage CSHCN information. The TN-CHP links data on newborn screening (NBS) and newborn hearing screening (NHS) from the public health database of the Tennessee Department of Health with data on diagnosis, treatment, and followup from programs providing CSHCN services. Outcome measures included rates of CSHCN identification from NBS and NHS, tracking of diagnosis, and delivery of CSHCN services. The project also investigated the effect of birth weight on the lag time between date of birth and diagnosis.

**Specific Aims:**
- Make available to health care providers secure Web access to a comprehensive EHR of CSHCN to ensure current information and continuity of care. *(Achieved)*
- Improve the coordination and quality of care provided to CSHCN in ambulatory settings by the use of health information technology. *(Achieved)*
- Provide accurate, comprehensive health care information for developmental tracking of children. *(Achieved)*

**2010 Activities:** The project team conducted statistical analysis of outcome measures for followup of NBS and NHS and developed the final report.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of January 2010):** This project is complete with all major milestones achieved. The allocated funds were underspent in the first three years but were expended during the no-cost extension period of the project.

**Impact and Findings:** The major successes include: 1) the development of a comprehensive, Web-based EHR for CSHCN; 2) the participation of major stakeholders representing State departments, academic centers, and consumer agencies; and 3) data analysis of outcomes, including followup of NBS and NHS that was conducted and showed the lag times between birth and dates of screening tests and diagnosis and numbers of confirmed cases.
Specifically, the team found that there is a statistically significant difference in mean lag time of 1.65 days from date of birth to first collect between the low birth-weight babies (<1,500 grams) and those weighing 2,500 grams or more, and a statistically significant difference in mean lag time of 1.35 days from date of birth to first collect between the low birth-weight babies and those weighing between 1,500 and 2,500 grams. They also found that low birth-weight babies experience a mean lag time from date of birth to first report that is nearly five days longer than babies with weights from 1,500-2,500 grams, and more than 9.0 days longer than babies with weights greater or equal to 2,500 grams. Finally, low birth-weight babies experience a mean lag time from first collect to first report that is nearly five days longer than babies with weights from 1,500-2,500 grams, and 7.3 days longer than babies with weights greater than or equal to 2,500 grams.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Table 8. Grant Summaries (ASQ)

<table>
<thead>
<tr>
<th>Completed in 2010</th>
<th>Principal Investigator</th>
<th>Project Title</th>
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<tr>
<td>No</td>
<td>Adams, William, MD</td>
<td>Conversational Information Technology for Better, Safer Pediatric Primary Care</td>
<td>HS07-007</td>
<td>52</td>
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<td>No</td>
<td>Bove, Alfred, MD</td>
<td>Using a Telemedicine System to Promote Patient Care Among Underserved Individuals</td>
<td>HS07-007</td>
<td>54</td>
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<td>No</td>
<td>Burns, Edith, MD</td>
<td>Enhancing self-management of Type 2 Diabetes With an Automated Reminder and Feedback System</td>
<td>HS07-007</td>
<td>57</td>
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<td>No</td>
<td>Chrischilles, Elizabeth, PhD</td>
<td>Personal Health Records and Elder Medication Use Quality</td>
<td>HS07-007</td>
<td>59</td>
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<td>No</td>
<td>Chueh, Henry, MD</td>
<td>Ambulatory Care Compact to Organize Risk and Decisionmaking (ACCORD)</td>
<td>HS07-007</td>
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<tr>
<td>No</td>
<td>Hahn, Elizabeth, MA</td>
<td>Implementing a Low-Literacy, Multimedia Information Technology System to Enhance Patient-Centered Cancer Care</td>
<td>HS07-007</td>
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<td>No</td>
<td>Jack, Brian, MD</td>
<td>Virtual Patient Advocate to Reduce Ambulatory Adverse Drug Events</td>
<td>HS07-007</td>
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<td>No</td>
<td>Krist, Alexander, MD</td>
<td>An Interactive Preventive Health Record (IPHR) to Promote Patient-Centered Care</td>
<td>HS07-007</td>
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<td>Yes</td>
<td>Lapane, Kate, PhD</td>
<td>Tailored DVD to Improve Medication Management for Low Literate Elderly Patients</td>
<td>HS07-007</td>
<td>72</td>
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<td>Yes</td>
<td>Mold, James, MD</td>
<td>Impact of a Wellness Portal on the Delivery of Patient-Centered Prospective Care</td>
<td>HS07-007</td>
<td>75</td>
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<td>No</td>
<td>Samore, Matthew, MD</td>
<td>Patient-Centered Informatics System to Enhance Health Care in Rural Communities</td>
<td>HS07-007</td>
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<td>No</td>
<td>Schillinger, Dean, MD</td>
<td>Harnessing Health Information Technology for Self-Management Support and Medication Activation in a Medicaid Health Plan</td>
<td>HS07-007</td>
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<td>No</td>
<td>Stepnowsky, Carl, PhD</td>
<td>Enabling Sleep Apnea Patient-Centered Care Via an Internet Intervention</td>
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### Project Summaries

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<td>No</td>
<td>Tang, Paul, MD</td>
<td>Patient-Centered Online Disease Management Using a Personal Health Record System</td>
<td>HS07-007</td>
<td>86</td>
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<tr>
<td>No</td>
<td>Wagner, Peggy J., PhD</td>
<td>Using An Electronic Personal Health Record To Empower Patient With Hypertension</td>
<td>HS07-007</td>
<td>89</td>
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<tr>
<td>No</td>
<td>Wolf, Michael, PhD</td>
<td>Using Information Technology for Patient-Centered Communication and Decision Making about Medications</td>
<td>HS07-007</td>
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### Improving Quality Through Clinician Use of Health IT (IQHIT)

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<tr>
<th>Completed in 2010</th>
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<tr>
<td>No</td>
<td>Baker, David, MD</td>
<td>Using Precision Performance Measurement to Conduct Focused Quality Improvement</td>
<td>HS07-006</td>
<td>94</td>
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<td>No</td>
<td>Carrow, Grant, PhD</td>
<td>Enabling Electronic Prescribing and Enhanced Management of Controlled Medications</td>
<td>HS07-006</td>
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<td>No</td>
<td>Fischer, Michael, MD</td>
<td>Impact of Office-Based E-Prescribing on Prescribing Processes and Outcomes</td>
<td>HS07-006</td>
<td>100</td>
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<td>No</td>
<td>Forrest, Christopher, MD</td>
<td>Improving Otitis Media Care with Electronic Health Record-based Clinical Decision Support and Feedback</td>
<td>HS07-006</td>
<td>103</td>
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<td>No</td>
<td>Fox, Karen, PhD</td>
<td>The Bettering Lives Utilizing Electronic Systems (BLUES) Project: Improving Diabetes Outcomes in Mississippi with Health Information Technology</td>
<td>HS07-006</td>
<td>106</td>
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<td>No</td>
<td>Fricton, James, DDS, MS</td>
<td>eHealth Records to Improve Dental Care for Patients with Chronic Illnesses</td>
<td>HS07-006</td>
<td>109</td>
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<td>No</td>
<td>Gardner, William, PhD</td>
<td>Pharmaceutical Safety Tracking (PhaST): Managing Medications for Patient Safety</td>
<td>HS07-006</td>
<td>111</td>
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<td>No</td>
<td>Gorman, Paul, MD</td>
<td>RxSafe: Shared Medication Management and Decision Support for Rural Clinicians</td>
<td>HS07-006</td>
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<td>No</td>
<td>Gurwitz, Jerry, MD</td>
<td>Improving Post-Hospital Medication Management of Older Adults with Health Information Technology</td>
<td>HS07-006</td>
<td>116</td>
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<td>No</td>
<td>Johnson, Kevin B., MD, MS</td>
<td>Safety Through Enhanced e-PreScribing Tools (STEPStools): Developing Web Services for Safe Pediatric Dosing</td>
<td>HS07-006</td>
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<td>No</td>
<td>Kaushal, Rainu, MD</td>
<td>Electronic Prescribing and Electronic Transmission of Discharge Medication Lists</td>
<td>HS07-006</td>
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<tr>
<td>No</td>
<td>Kopal, Helene, MPH, MPA</td>
<td>Evaluation of a Computerized Clinical Decision Support System and Electronic Health Record-Linked Registry to Improve Management of Hypertension in Community-Based Health Centers</td>
<td>HS07-006</td>
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<td>No</td>
<td>Lapane, Kate, PhD</td>
<td>Optimizing Medication History Value in Clinical Encounters with Elderly Patients</td>
<td>HS07-006</td>
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<td>No</td>
<td>Lobach, David, MD, PhD, MS</td>
<td>Improving Quality through Decision Support for Evidence-Based Pharmacotherapy</td>
<td>HS07-006</td>
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<td>No</td>
<td>Mehr, David, MD, MS</td>
<td>Using Health Information Technology to Improve Ambulatory Chronic Disease Care</td>
<td>HS07-006</td>
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<td>No</td>
<td>Nebeker, Jonathan, MD</td>
<td>Veterans Administration Integrated Medication Manager</td>
<td>HS07-006</td>
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<td>Yes</td>
<td>Ornstein, Steven, MD</td>
<td>Medication Safety in Primary Care Practice—Translating Research into Practice</td>
<td>HS07-006</td>
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<td>No</td>
<td>Pohl, Joanne, PhD</td>
<td>A Partnership for Clinician Electronic Health Record Use and Quality of Care</td>
<td>HS07-006</td>
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<td>No</td>
<td>Schwarz, Eleanor, MD</td>
<td>Harnessing Health Information Technology to Prevent Medication-Induced Birth Defects</td>
<td>HS07-006</td>
<td>141</td>
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<td>Yes</td>
<td>Sequist, Thomas D., MD, MPH</td>
<td>Can Risk Score Alerts Improve Office Care for Chest Pain?</td>
<td>HS07-006</td>
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<td>No</td>
<td>Simon, Steven, MD, MPH</td>
<td>Improving Laboratory Monitoring in Community Practices: A Randomized Trial</td>
<td>HS07-006</td>
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<td>Yes</td>
<td>Singh, Gurdev, PhD, MsC</td>
<td>A Systems Engineering Approach: Improving Medication Safety</td>
<td>HS07-006</td>
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<td>No</td>
<td>Trivedi, Madhukar, MD</td>
<td>Using Information Technology to Provide Measurement Based Care for Chronic Illness</td>
<td>HS07-006</td>
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<td>No</td>
<td>Veline, James, MS, MA</td>
<td>Electronic Prescribing and Decision Support to Improve Rural Primary Care Quality</td>
<td>HS07-006</td>
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</table>

**Improving Management of Individuals With Complex Healthcare Needs Through Health IT (MCP)**

Completed in 2010

- Principal Investigator
- Project Title
- Funding Opportunity Announcement
- Summary
| No | Baker, Wende M., MEd | Chronic Mental Health: Improving Outcomes through Ambulatory Care Coordination | HS08-002 | 158 |
| No | Ciemins, Elizabeth, PhD | Evaluation of Effectiveness of an Health Information Technology-based Care Transition Information Transfer System | HS08-002 | 161 |
| No | Dorr, David, MD, MS | Enhancing Complex Care through an Integrated Care Coordination Information System | HS08-002 | 163 |
| No | Druss, Benjamin, MD, MPH | An Electronic Personal Health Record for Mental Health Consumers | HS08-002 | 165 |
| No | Feldman, Penny, PhD | Improving Medication Management Practices and Care Transitions through Technology | HS08-002 | 167 |
| No | Field, Terry, DSc | Using Health Information Technology to Improve Transitions of Complex Elderly Patients from Skilled Nursing Facilities (SNF) to Home | HS08-002 | 169 |
| No | Friedman, Robert, MD | A Longitudinal Telephone and Multiple Disease Management System to Improve Ambulatory Care | HS08-002 | 171 |
| No | Kahn, James, MD | Randomized Control Trial Embedded in an Electronic Health Record | HS08-002 | 174 |
| No | Lobach, David, MD, PhD, MS | Improving Care Transitions for Complex Patients through Decision Support | HS08-002 | 176 |
| No | Mertens, Ann, PhD | Improving Pediatric Cancer Survivorship Care Through SurvivorLink | HS08-002 | 179 |
| No | Ritchie, Christine, MD, MSPH | e-Coaching: Interactive Voice Response-Enhanced Care Transition Support for Complex Patients | HS08-002 | 181 |
| No | Singh, Hardeep, MD, MPH | Using Electronic Data to Improve Care of Patients with Known or Suspected Cancer | HS08-002 | 184 |

### Enabling Quality Measurement Through Health IT (EQM)

<table>
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<tr>
<th>Completed in 2010</th>
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<th>Project Title</th>
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<td>Yes</td>
<td>Bailey, Thomas, MD</td>
<td>Surveillance for Adverse Drug Events in Ambulatory Pediatrics</td>
<td>HS07-002</td>
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<td>Status</td>
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<td>Yes</td>
<td>Davidson, Arthur, MD</td>
<td>Colorado Associated Community Health Information Exchange (CACHIE)</td>
<td>Yes</td>
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<td>Yes</td>
<td>Hazlehurst, Brian L., MD</td>
<td>Automating Assessment of Asthma Care Quality</td>
<td>Yes</td>
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<td>No</td>
<td>Kaushal, Rainu, MD</td>
<td>Developing and Using Valid Clinical Quality Metrics for Health Information Technology with Health Information Exchange</td>
<td>No</td>
<td>HS07-002</td>
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<td>Yes</td>
<td>Lehmann, Christoph, MD</td>
<td>Medication Monitoring for Vulnerable Populations via Information Technology</td>
<td>Yes</td>
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<td>Yes</td>
<td>Logan, Judith, MD</td>
<td>Improving Quality In Cancer Screening: The Excellence Report For Colonoscopy</td>
<td>Yes</td>
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<td>Yes</td>
<td>Schneider, Eric, MD</td>
<td>Massachusetts Quality E-Measure Validation Study</td>
<td>Yes</td>
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<td>Yes</td>
<td>Selby, Joe, MD</td>
<td>Feedback of Treatment Intensification Data to Reduce Cardiovascular Disease Risk</td>
<td>Yes</td>
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<td>Yes</td>
<td>Thomas, Eric, MD</td>
<td>Using Electronic Records to Detect and Learn from Ambulatory Diagnostic Errors</td>
<td>Yes</td>
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<td>Yes</td>
<td>Turchin, Alexander, MD</td>
<td>Monitoring Intensification of Treatment for Hyperglycemia and Hyperlipidemia</td>
<td>Yes</td>
<td>HS07-002</td>
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<td>Yes</td>
<td>Weiner, Mark, MD</td>
<td>Crossing the Quality Assessment Chasm: Aligning Measured and True Quality of Care</td>
<td>Yes</td>
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<td>Yes</td>
<td>Williams, Andrew, PhD</td>
<td>Using Information Technology to Improve the Quality of Cardiovascular Disease (CVD) Prevention and Management</td>
<td>Yes</td>
<td>HS07-002</td>
</tr>
<tr>
<td>No</td>
<td>Wu, Winfred, MD</td>
<td>Bringing Measurement to the Point of Care</td>
<td>No</td>
<td>HS07-002</td>
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Conversational Information Technology for Better, Safer Pediatric Primary Care

**Principal Investigator:** Adams, William, M.D.  
**Organization:** Boston Medical Center  
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)  
**Grant Number:** R18 HS 017248  
**Project Period:** September 2007 – August 2011, Including No-Cost Extension  
**AHRQ Funding Amount:** $1,159,609  
**Summary Status as of:** December 2010

**Target Population:** Medically Underserved, Pediatric

**Summary:** This project seeks to develop and evaluate an automated telephony system as part of prevention services delivered in an urban pediatric practice. The system gathers personal health data and counsels parents before scheduled visits, integrates the data with the physician’s electronic health record (EHR), and offers personalized followup assessment and counseling after visits. The internally developed interactive voice response (IVR) telephony system interfaces with the providers’ EHR, GE Centricity Physician Office. The telephony system, called the Personal Health Partner (PHP), uses fully automated, interactive conversations (including synthetic speech and speech recognition) to gather health data and counsel parents before scheduled pediatric primary care visits. Parent-entered data are shared with the child’s primary care provider (PCP) via the EHR, where data are reviewed and clinician decision support is provided. The system is being evaluated via a three-armed randomized controlled trial (PHP only, PHP assessment with counseling, or usual care groups) to determine the marginal effect of the PHP intervention on: comprehensive preventive and medication management assessments during PCP visits; preventive and medication management counseling; healthier parental behaviors; and increased parental activation.

**Specific Aims:**
- Develop an automated telephony system that uses fully automated conversations to perform pre-visit pediatric primary care assessments, offer parental counseling (including appropriate medication use), and support clinician decisionmaking by incorporating the PHP child assessments into their EHR at the point-of-care. *(Achieved)*
- Conduct a randomized clinical trial to determine: 1) whether PHP assessment alone (no counseling) with EHR data exchange leads to higher quality preventive care and medication management, and 2) whether the addition of PHP counseling to PHP child assessments (before and after visits) is associated with increased quality and healthier parental behaviors. *(Ongoing)*

**2010 Activities:** Data exchange between the PHP telephony system and the EHR is complete, and the system is now fully operational. The hospital’s clinical data warehouse continues to deliver appointment and medication data into the team’s SQL Server database. Families are using PHP successfully and providers are able to access this information in the EHR. Providers can review the data provided by parents and determine whether to accept the information to prepopulate the visit documentation.
The grant team is using the PHP Manager (a PowerBuilder application) to print recruitment letters, appointment labels, and mailing labels. They have been actively recruiting participants since April 2009, and plan to continue recruitment through February 2011. Recruitment strategy improvements, including outbound reminder calls (initiated in late 2009) and increases in participant reimbursement (starting in September 2010), have continued to improve recruitment rates.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Active recruitment continued throughout 2010, and recruitment rates have continued to increase. The team remains approximately six months behind the original project schedule. Using no-cost extension funds, the team has extended the subject recruitment period and fully expects to achieve all study aims. Most milestones are being met, and there is a viable plan for achieving the others. Budget spending is roughly on target.

**Preliminary Impact and Findings:** Preliminary analyses, presented at the 2010 American Medical Informatics Association Conference in a poster titled, "The Personal Health Partner: Conversational IT for Better, Safer Pediatric Primary Care," indicate that use of a patient-centered IVR system such as PHP before routine health care maintenance visits can lead to more comprehensive information at visits, identifying and counseling parents with important issues, and better preparing parents and clinicians for visits. Such systems have the potential to improve quality and efficiency in primary care settings.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

*AHRQ Priority Population*
Using a Telemedicine System to Promote Patient Care Among Underserved Individuals

**Principal Investigator:** Bove, Alfred, M.D.

**Organization:** Temple University Clinical Research Center

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)

**Grant Number:** R18 HS 017202

**Project Period:** September 2007 – August 2011, Including No Cost Extension

**AHRQ Funding Amount:** $1,198,371

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Hypertension, Inner City*, Medically Underserved, Racial or Ethnic Minorities*: African Americans

**Summary:** Hypertension affects more than 65 million people in the United States, disproportionately among African Americans. Untreated hypertension is associated with an increased risk for myocardial infarction, sudden death, stroke, and renal failure. Despite the importance of controlling hypertension and the availability of therapy, the clinical application of well-established guidelines has been sub-optimal and inadequate blood pressure control remains all too common.

A patient-provider partnership relationship is needed to advance care for chronic conditions such as hypertension. Patient empowerment must be increased through education, self-management, collaborative goal setting, and treatment planning. Patient-centered care (PCC) has been implemented for acute ambulatory settings; however, chronic disease management and prevention present unique challenges for PCC since the patient is followed through episodic office visits. Chronic disease care requires innovative strategies to support the constructs of PCC in an efficient and cost-effective manner. Telemedicine has the capacity to empower the patient, strengthen the patient-provider relationship, and support a chronic care model of PCC in a realistic and sustainable manner.

The goal of this project is to develop a patient-centered tool for managing hypertension within a primary care practice. The project builds upon a pre-existing, internally developed telemedicine system that patients access via the Internet. The system provides patient education on hypertension and serves as a tool for self-management, shared decision-making, and treatment planning. A cellular telephone interactive system accommodates subjects who do not have Internet access. The system incorporates: hypertension treatment guideline education modules; self-reporting modules on topics such as blood pressure, weight, exercise, diet, and smoking; and automated reminders and feedback. The project team observes patients’ responses to care measures aimed at lowering their blood pressure to normal, as defined by standards of the Joint National Committee. Patients complete one of seven lessons per login after which they receive an automated reminder of the guidelines. An automatic report created from the database is sent to both the primary care physician and the patient on a monthly basis. The report describes, in both text and graphics, the patient’s blood pressure over that month, the medications the patient was on, and whether the patient is at his or her goal blood pressure. Additionally, it recommends a physician visit to those that are not within the goal. The primary outcome measure of this randomized, controlled trial is the
proportion of subjects who achieve goal blood pressure. Secondary measures include the rate of self-monitoring, exercise measured as steps per day, weight, cardiovascular disease knowledge, number of patients meeting medication guidelines, and satisfaction with the practice.

**Specific Aims:**

- Enhance the current telemedicine system by incorporating guideline-based algorithms for hypertension treatment as well as automated reminders and feedback for both patients and health care providers. (**Achieved**)
- Determine the percentage of patients meeting guidelines for anti-hypertensive medication therapy. (**Ongoing**)
- Empower inner-city African American patients to take a more active role in their health care through self-monitoring, education, reinforcement, and feedback through telemedicine. (**Ongoing**)
- Measure telemedicine utilization. (**Ongoing**)
- Examine the impact of the telemedicine system on medical knowledge, self-efficacy, and the quality of doctor-patient interaction as compared to controls. (**Ongoing**)
- Compare blood pressure outcomes between control and telemedicine groups after 6 months of telemedicine risk management. (**Ongoing**)

**2010 Activities:** This study, which was granted a no-cost extension to provide additional time for participant recruitment, is in its fourth year. During 2010, recruitment was closed at the two sites, Temple University Hospital in Pennsylvania and Christiana Medical Center in Delaware. The project staff screened 536 subjects and enrolled 241 (45 percent) into the study, 117 (49 percent) of whom were randomized into the telemedicine arm. Two hundred and three subjects have completed the study, and 18 have chosen to continue using the system following completion of the 6-month study period. All patient followup is scheduled to be completed by March 2011.

As the study was implemented, the researchers found that the target population (inner city, underserved patients) frequently had limited access to the Internet, which was the initial medium for the telemedicine intervention. Early surveys, however, indicated that nearly all study participants have access to land or cellular phones. In response, the research team integrated an interactive voice response (IVR) component to their intervention to facilitate use by a broader population. IVR acts as an interface between patients and the telemedicine system and expands access to people who may benefit from use of the system.

The research team has also begun data cleaning and preliminary data analyses. The team has started evaluating usage and the clinical datasets. Additional analyses will include assessment of patient perceptions of the intervention and changes in medication resulting from the intervention. To account for potential differences between IVR and computer users, the analyses will be stratified by these two points of access. Data analysis is on track and scheduled to be completed in August 2011.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Overall this project is making good progress and is on track with revised project milestones and spending.

**Preliminary Impact and Findings:** According to the current baseline data, the demographics of the sample are reflective of the clinics’ patient populations and indicate a need for improved cardiovascular risk management. An interim analysis indicates a statistically significant improvement from baseline in both intervention and control groups across systolic blood pressure, diastolic blood pressure, total
cholesterol, low density lipoproteins, high density lipoproteins, triglycerides, and fasting blood glucose. Additionally, a statistically significant decrease in systolic blood pressure was observed between the two study arms, indicating additional improvements in blood pressure control over time in the telemedicine arm versus the control arm.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Enhancing Self-Management of Type 2 Diabetes With an Automated Reminder and Feedback System

Principal Investigator: Burns, Edith, M.D.
Organization: Medical College of Wisconsin Affiliated Hospitals
Mechanism: RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care Through Health Information Technology (PCC)
Grant Number: R18 HS 017276
Project Period: September 2007 – August 2011, Including No-Cost Extension
AHRQ Funding Amount: $1,166,243
Summary Status as of: December 2010

Target Population: Chronic Care*, Diabetes, Elderly*, Medically Underserved, Veterans

Summary: This project tests whether an automated self-management monitor (ASMM) that reminds patients to self-monitor their blood glucose (SMBG), prompts them to take medications, and provides education on the impact lifestyle choices has on glycemic control and self-management behaviors. The ASMM, which was developed by the project team, is composed of a simple personal computer-glucometer interface unit with specialized software. The software receives data downloaded through the glucometer interface; interprets the measures; matches them with individualized profiles for glycemic monitoring and control; and provides appropriate, individualized audio feedback. Feedback is based on a fuzzy logic algorithm, which is feedback on one value while taking into account previous values, as well as the Common Sense Model of Illness, or experience-based beliefs. These provide information on long-term control, as well as single glucose measures.

To demonstrate the effectiveness of the intervention, the project team is recruiting adults from community health centers and the Veteran’s Health Administration to participate in a randomized, controlled trial. To be eligible for participation, subjects must have poorly controlled diabetes, defined as hemoglobin A1c (HbA1c) levels greater than 8 percent. Once participants are recruited, the project team contacts providers to obtain information about patients’ glucose checking schedules and glycemic targets. A team member visits a participant’s home to collect baseline data, and provide the glucometer and supplies necessary to perform SMBG. At a second home visit 3 months later, a member of the team provides the participant with a standard set of educational materials, administers study surveys, determines any self-reported change in medication regimen, and downloads glucometer data. Patients are then randomized into intervention and usual care groups. For intervention group participants, the researcher also installs the ASMM, trains the participants to use the system, and reviews the reminders provided by the system. Additional home visits are conducted by the research team at 9 and 15 months after enrollment. The primary outcome measure is change in HbA1c. Secondary measures include self-management behaviors such as SMBG frequency, nutritional choices, physical activity, medication adherence, and patient use of diabetes educational materials.

Specific Aims:
• Demonstrate that use of the ASMM improves glycemic control in inadequately-controlled people with Type 2 Diabetes. (Ongoing)
• Demonstrate that this effect is sustained over longer term followup. (Ongoing)
• Identify self-management practices that improve in people using the ASMM. (Ongoing)

2010 Activities: The trial was completed in October 2010. A total of 201 participants were randomized, with 102 individuals in the intervention group and 99 in the usual care group. Of these, 71 intervention participants and 89 usual care participants completed the 15-month study with analyzable ASMM data.

During the year, significant effort was dedicated to data cleaning, coding, and analysis. Statisticians reviewed the data files to merge and reconcile data recorded by the glucometers and data collected by the ASMM docking system. Additionally, statisticians started to look at differences between the data collected from the Veteran’s Health Administration and community-based care, including differences in loss-to-followup between the two study arms.

The study team is also trying to determine which patients engaged the intervention. While some patients decided that they did not want to keep the ASMM system, other patients kept the system but did not use it. Therefore the analysis team will perform an intent-to-treat analysis as well as a second analysis of patients who actively engaged with the intervention to determine whether those who actually received feedback from the ASMM demonstrated improved glycemic control. The team will also assess characteristics of individuals who used the intervention to help inform clinicians about patients who are most likely to benefit from this approach to diabetes care.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): All aims and milestones are on track and data collection is in process. The trial has been completed and data have been collected and cleaned. Analyses to evaluate the intervention will be the focus of the next year.

Preliminary Impact and Findings: Randomization was successful, with no significant differences in demographic variables or baseline HbA1c levels between the usual care and intervention groups. Efforts to distinguish between intervention group participants who used the ASMM and those who did not indicate that seven participants refused at the installation stage but stayed in the study, three had the system installed but never used it, three were unable to use the system for other reasons, and 18 dropped out of the study.

Preliminary analyses of dietary data show no significant relationships between broad dietary components (total carbohydrates, total calories, total protein, total fiber, calories from fat) and HbA1c. However, participants with initial HbA1c levels lower than 14 appear to have lower total carbohydrates, total fiber, and fat-derived calories than those with baseline HbA1c greater than 14. Analyses of patient characteristics and glycemic control identified a statistically significant correlation between commonsense beliefs about diabetes and glycemic control.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use

* AHRQ Priority Population
Personal Health Records and Elder Medication Use Quality

Principal Investigator: Chrischilles, Elizabeth, Ph.D.
Organization: University of Iowa
Mechanism: RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
Grant Number: R18 HS 017034
Project Period: September 2007 – August 2011, Including No-Cost Extension
AHRQ Funding Amount: $1,199,999
Summary Status as of: December 2010

Target Population: Elderly*, Medicare

Summary: Use of medications by older adults living in the community is far from optimal as medication errors including overuse, underuse, and misuse, are common. The Medicare Modernization Act (MMA) of 2003 required health plans to provide medication therapy management (MTM) services to optimize therapeutic outcomes among high-risk patients with multiple chronic conditions taking multiple medications. Because the MMA did not dictate how health plans should deliver MTM, various delivery methods exist. Regardless of delivery method, a model of patient-centered MTM requires that the patient play a pivotal role in self-monitoring, self-evaluation, goal setting, and medication taking. The features of a patient controlled personal health record (PHR) system parallel and are thought to enhance these critical behaviors. By enhancing patient MTM behaviors, the use of PHRs may result in improved patient-provider communication, care continuity, better prescribing, and medication adherence.

The project is evaluating the ability of a PHR to support and improve elderly patients’ medication adherence, use, and management. The team is testing the hypothesis that a successfully maintained PHR provides reinforcement to build self-efficacy for MTM, that an up-to-date PHR increases patient knowledge about medications, and that PHR-gained information allows patients to shift their beliefs about medication from concern to understanding.

Phase I of the project consisted of a series of patient, caregiver, and provider focus groups aimed at identifying patient and physician medication management practices, barriers to PHR use, and physician office workflow issues. Through the evaluation of the feedback received during these sessions, the project team identified patients’ and providers’ wants and needs with respect to the varied functionalities of PHR products and developed a formal measure of the patients’ role in maintaining their health. The project team also conducted an environmental scan of commercially available PHR products to identify existing core PHR functions available to elderly patients. The project team developed a PHR that best met the criteria of the identified core functions.

Phases II and III are hands-on trials of patients’ interaction with the internally developed PHR. The team tested the PHR by measuring elderly patients’ interaction with the technology and their resulting self-activation with respect to medication management. Based on Phase I feedback, the project team incorporated patient and provider suggestions into the product. Phase II was a usability study of the PHR, via a human-computer interaction (HCI) laboratory assessment of elderly adults, to identify the challenges patients face when using the PHR, and the support needed to facilitate usage. After Phase
II testing, it was determined that the commercially available PHR was not well-suited for medication management activities. A new PHR was therefore developed using participatory design methodologies. Phase III is a randomized controlled trial of the new PHR comparing older adults using the PHR with those randomized to no PHR use across outcomes, patient-physician communication, and other technology utilization measures. Core activities to be analyzed as behavior-based measures of patient participation include keeping an active medication list, recording the purpose of each medication, reporting side effects to providers, and asking questions about medications.

**Specific Aims:**

- Develop measures of patient MTM behaviors and patient self-efficacy for MTM. *(Achieved)*
- Compare the patient-reported MTM behaviors, medication adherence, patient- and physician-centric medication quality indicators, patient self-efficacy for MTM, and patient beliefs about medication among patients randomized to a current, representative PHR system versus patients randomized to usual care. *(Ongoing)*
- Investigate the usability of PHR system in an HCI interaction laboratory compared with alternative prototypes developed through participatory design with older adults of varying ability levels. Associate PHR performance with measures of cognitive, motor, and perceptual ability. *(Ongoing)*

**2010 Activities:** As part of the PHR development process, staff incorporated most of the “desirable” functions as identified through their earlier focus group and participatory design sessions. In addition, they incorporated detailed tracking functionality to enable them to describe the PHR user experience. Seventeen medication messages, grounded in Assessing Care of Vulnerable Elderly quality indicators, were developed and are displayed to PHR users upon entry of a trigger medication. The messages were evaluated by two physicians and two pharmacists and the study team implemented revisions based upon their feedback. Each resulting message contains three levels of increasingly detailed information. Three focus groups with older adults were conducted to elicit feedback on the PHR prototype (University of Iowa version). In two of the sessions, the team presented the medication entry form to participants and asked for feedback on PHR layout and functionality. For the remaining session, the team presented examples of draft medication messages and received feedback on layout, structure, and content.

At the end of 2010, questionnaires were sent to 2,372 people who were eligible for the trial per their screening questionnaire responses. Of these individuals, 1,176 completed and returned baseline questionnaires, for a response rate of 49.6 percent. The team randomized individuals (at a 3:1 ratio) and sent invitations and a quick start guide to use the PHR (PHR group), or a thank you letter (control group) to 840 and 280 people, respectively.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is mostly on track, and project spending is roughly on target. The intervention is underway and the project team is focused upon collection and analysis of qualitative and quantitative data.

**Preliminary Impact and Findings:** Findings from the focus groups with family physicians suggested that providers predominantly view PHRs as a backup source of medical information, secondary to the patient’s medical record, as opposed to a tool for patients. While providers believe PHRs have the potential to decrease errors and increase efficiency, they are concerned about how to integrate PHRs into patient visits that are already too short. Preliminary results revealed that older users were much less likely to be able to complete key medication-related tasks using the commercial PHR system. For example, whereas
69 percent of younger users were able to successfully enter medications into the system, the same was true for only 25 percent of older users. All younger users were able to successfully change the strength of a medication, while only 25 percent of older users were able to do so.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the exchange of electronic health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Ambulatory Care Compact to Organize Risk and Decisionmaking

**Principal Investigator:** Chueh, Henry, M.D.
**Organization:** Massachusetts General Hospital
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care Through Health Information Technology (PCC)
**Grant Number:** R18 HS 017190
**Project Period:** September 2007 – August 2011, Including No-Cost Extension
**AHRQ Funding Amount:** $923,783
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Primary care in our current health system is fragmented, inefficient, and frequently unsafe. Efforts to improve quality of care, focusing on a relatively narrow set of quality measures, and increasing emphasis on care guidelines have transformed the practice of medicine in ways that are both good and bad for patients and clinicians. Standardized care algorithms attempt to promote uniform compliance with evidence-based care, but are underutilized. This may be due to their inability to accommodate individual patient and clinician preferences and values. With greater access to health information via the Internet and other media, patients are increasingly involved in the medical decisionmaking process. At the same time, advances in health information technology (IT) have ushered in electronic health records (EHRs), increasing capacity to identify and track patient populations within a health system. These advances will facilitate the design of new models of primary care delivery that employ system-level health IT tools to promote patient and clinician partnerships.

This project’s objectives are to design, develop, implement, and evaluate a comprehensive, practical, and innovative model of care delivery to support the process of shared decisionmaking. The system, titled Ambulatory Care Compact to Organize Risk and Decisionmaking (ACCORD), will allow patients to collaborate with clinicians to establish, monitor, and track shared clinical care plans. ACCORD will interface with the Massachusetts General Primary Care Practice-Based Research Network’s preexisting, internally developed Computer Stored Ambulatory Record EHR system.

The project team is developing ACCORD to help providers and patients manage followup activities determined at primary care visits. The team selected the following domains to maintain through ACCORD: preventive health screenings, abnormal findings followup, and medication monitoring. ACCORD will enable patient-specific care plan development to reduce miscommunication between providers and patients by presenting care plans as explicit “compacts” or agreements between provider and patient, and by providing explanatory information about the risks of not adhering to the plans. The project team is working to ensure that patients and providers are comfortable proposing the care plans in this manner.

The project activities are organized into three steps. Step one is to design, build, and test the system to develop a usable method of compact authoring and tracking. Step two will test the tool to determine if providers and patients are comfortable creating explicit agreements and if the tool is effective in this capacity. Step three is to conduct one or more randomized controlled trials (RCTs) in a primary care practice, and an institution-wide cohort in another primary care practice to examine system adoption.
and process measures. The RCTs will examine differences in outcomes, such as preventive screening test completion, chronic disease management, patient engagement, patient knowledge, patient-provider communication, patient and clinician satisfaction, and various system-utilization metrics.

**Specific Aims:**

- Design a model for patient-centered primary care that facilitates patient-clinician partnerships that results in documented followup care plans that can be tracked reliably to reduce the risk of care plans being lost to followup in busy primary care networks. *(Achieved)*
- Develop a health IT architecture and software (i.e., ACCORD) to support the developed patient-centered care-delivery model. *(Ongoing)*
- Implement and evaluate ACCORD in an RCT within the Massachusetts General Primary Care Practice-Based Research Network. *(Upcoming)*

**2010 Activities:** Dr. Chueh and his team completed design and implementation of the ACCORD scheduling, event detection, and notification engines. Early physician feedback emphasized that ACCORD needed to integrate smoothly with clinician workflow or else it would not be used by clinicians. Integration tasks underway during this timeframe included: 1) generating clinical documentation with a coded problem and problem-linked comment for the structured problem list and 2) integrating ACCORD event notification with the clinician view of the patient schedule. The team completed the addition of associations between “observations” abstractly represented in the ACCORD templates and the actual encoded information available from data services at the institution.

The grant team began design of the randomized controlled trial. Revisions will take into account recruitment delays and the new scenario for initiating ACCORD from patient lists in Oncall Answers result sets, the local EHR. The current study design for the controlled trial focuses on three ACCORDs expected to be appropriate for a relatively high-frequency of the study population. The population eligible within the study timeframe will be identified by query, and targeted for additional enrollment support, in both control and intervention groups. Intervention group providers will be trained to use ACCORD in both the episodic, one problem at a time scenarios initially conceived, and the more recently recognized cohort-based scenario in which providers propose the same range of ACCORD options to a whole list of patients matching specific indications.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is on track in some respects. The project experienced significant delays early in the calendar year because of the delayed release of the iHealthspace patient portal to the practice where the ACCORD control trial was to be implemented. A viable plan is in place for addressing delays. Project spending is roughly on target.

**Preliminary Impact and Findings:** ACCORD templates provide a structured representation of the plans of care to be jointly considered by the physician and patient seeking to form an ACCORD. This structured representation includes a schedule of expected actions that could be used as the basis for automated notifications when deviations from agreed upon plans of care are detected. As the project progressed, it became clear that templates need to perform four additional functions. First, they need to be locally configured to link to the relevant, locally available knowledge resources. Second, while ACCORD templates are defined in terms of an abstracted notion of “observations”, there still needs to be a local configuration that associates observations with specific data services and the appropriate parameters (usually codes) for those data services. Third, templates need to support local configuration...
of information to guide linkage with clinical documentation to the appropriate sections of the locally available EHR. Fourth, each ACCORD template needs to be annotated with indications to support keyword searches for templates that will use the same terms used in clinical queries that find appropriate patient candidates.

Linkage of clinical documentation generated by ACCORD into the local EHR has shown to be more complicated than was anticipated. The ability to generate an independent “ACCORD note” to insert into the store of visit notes represents just the minimum requirement. To support the care process, the ACCORD documentation should be able to drive updates to the problem list, and place text where the plan of care for the problem usually goes. The issue regarding the project local EHR, Oncall, will be solved by enabling the clinician to specify the problem to which the ACCORD should be linked. To support faster physician choice, templates need to be linked to a list of the most likely possible problems, and a “preferred” problem. From this general list, combined with the patient-specific problem list, an ordered list of default selections emerges from which the clinician may choose one. During the last quarter in 2010, the team completed annotation of the templates in the library with lists of possible problems.

Annotating the templates with problems provided new insight into different types of ACCORDs. Some ACCORDs are easier to connect to a well-defined set of problems than others. What makes problem-linking more or less difficult is the specificity of the ACCORD template and where the ACCORD lies on the diagnostic path.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use
Implementing a Low-Literacy, Multimedia Information Technology System to Enhance Patient-Centered Cancer Care

**Principal Investigator:** Hahn, Elizabeth, M.A.

**Organization:** Northwestern University

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care Through Health Information Technology (PCC)

**Grant Number:** R18 HS 017300

**Project Period:** September 2007 – September 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,198,839

**Summary Status as of:** December 2010

**Target Population:** Adults, Cancer, Low Literacy, Low SES/Low Income*, Medically Underserved, Safety Net

**Summary:** Cancer-related information, if delivered in a user-friendly way, can reach populations with limited literacy skills. The research team hypothesizes that promoting patient understanding of disease and treatment through innovative information delivery methods will in turn promote better communication; treatment adherence; and outcomes including patient satisfaction with health care, patient-provider communication, cancer-related knowledge, patients’ self-efficacy, treatment, and health-related quality of life (HRQL).

This project modifies a widely-used talking touchscreen multimedia information and assessment system for patients being treated for breast and colorectal cancer to be more accessible for patients across the spectrum of literacy skills. The CancerHelp® Talking Touchscreen (TT), developed by the CancerHelp Institute and investigators on this grant, is available at any time during clinic hours via a kiosk at the site. The software provides patient education on diagnoses, treatment, support, side effects, prevention, and screening. It contains easy access to cancer information from the National Cancer Institute, user statistics, and customizable features. Strategies will be implemented to enhance the ease of understanding the material and navigating through the program. For example, the amount of text on each screen will be shortened; patients will have the option to choose between text-based or audio presentation of education materials, communication tools, and assessment questions; and videos will be developed for certain modules.

During regular visits to cancer care centers for treatment, participants will interact with the adapted CancerHelp TT, which will enable patients to print information and generate a visit-specific checklist of their top priorities to discuss with their providers. At the conclusion of their in-clinic cancer treatments, participants in the intervention arm will also receive a post-treatment cancer survivorship care plan, modeled on templates from the Institute of Medicine. The survivorship care plan summarizes the cancer treatments they have received and provides appropriate aftercare recommendations, including detailed contact information for future appointments. Participants’ oncologists review the care plan with them and instruct them to provide a copy to their primary care physicians. This survivorship care planning is designed to minimize the interruptions in care that can occur when patients complete their cancer treatments.

The intervention will be evaluated through a randomized controlled trial (RCT) of 200 patients with breast or colorectal cancer conducted at three ambulatory cancer care centers. Patients in both the intervention
group and control group will use the TT to complete surveys on knowledge, satisfaction, HRQL, and other study measures up to three times during treatment and once afterwards. Both groups will receive diagnosis- and treatment-specific brochures; however, only patients randomized to the intervention arm will have access to the software adapted for this intervention.

**Specific Aims:**

- Test whether a low-literacy-friendly multimedia information and assessment information technology system used in daily clinical practice improves patient outcomes during treatment in 200 recently diagnosed breast and colorectal cancer patients based on the primary endpoints: satisfaction with health care communication, knowledge of cancer and treatment, self-efficacy, adherence to recommended treatment, and HRQL. *(Ongoing)*
- Evaluate the relationships between patient characteristics, resources, needs, health behaviors, and health outcomes using the Behavioral Model for Vulnerable Populations. *(Upcoming)*
- Test whether use of the multimedia information technology system improves adherence to recommended post-treatment surveillance care and HRQL during the early post-treatment surveillance period (3 months after treatment). *(Upcoming)*

**2010 Activities:** At the start of the year, the research team began to recruit and enroll patients into the RCT. The team held regular onsite meetings with the directors of the three participating sites to review procedures for identifying and enrolling patients. These meetings facilitate communication, organization of patient data, and identification of the physician responsible for presenting the survivorship plan to the patient. Two of the three sites are meeting their recruitment goals. The principal investigator and director of the third site met to address their low recruitment numbers and to develop and implement strategies to increase recruitment. However, it was determined that patient volume at the site was lower than expected and therefore the site would not be able to support the target sample size. As a result, the third site will be replaced by a clinic with heavier patient volume. While the team would have preferred to recruit patients from all four sites, this arrangement was not possible due to funding. The principal investigator has met with the director of the new site to discuss the study and recruitment. As of the end of 2010, 50 patients were randomized to the intervention arm and 43 to the control arm.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is on track with the revised timeline due to replacing one of the clinics. The project budget is somewhat underspent due to delays in recruitment.

**Preliminary Impact and Findings:** Thirteen patients were enrolled in field testing that was completed toward the end of 2009. Patient feedback was largely positive, and was used to improve the software. Recruitment and enrollment for the study is in progress. The team has begun to look at preliminary data. Participant characteristics will be assessed as interim recruitment goals are achieved.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Virtual Patient Advocate to Reduce Ambulatory Adverse Drug Events

**Principal Investigator:** Jack, Brian, M.D.
**Organization:** Boston Medical Center
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care (PCC) Through Health Information Technology
**Grant Number:** R18 HS 017196
**Project Period:** September 2007 – August 2011, Including No-Cost Extension
**AHRQ Funding Amount:** $1,180,772
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** The transition period between hospitalization and the first post-hospitalization ambulatory visit has a high risk for medical errors. The objective of this project is to expand the use of an animated conversational agent to assist patients during this transition. In prior studies, the project team developed a paper-based tool, the After Hospital Care Plan (AHCP), to deliver the Re-Engineered Hospital Discharge, a set of recommended activities to be performed at the time of discharge. Subsequently, in order to make the AHCP electronically available, Dr. Jack and his team developed the Virtual Patient Advocate (VPA), a computerized, animated character that emulates the face-to-face conversational behavior of an empathic provider.

Following hospital discharge, patients have access to VPA via a Web portal, and are encouraged to use it before their first visit with their primary care physician (PCP). The VPA offers health education, advice on monitoring and self-care, and assessment of medication dosing and adherence. To meet the needs of an ambulatory environment, the team is modifying the content, logic, layout, workstation, AHCP, and training manual. The team is also developing links between the VPA system, Boston Medical Center’s Certified Commission for Health Information Technology-certified GE Centricity electronic medical record (EMR), and the ambulatory providers’ information technology (IT) systems, as well as conducting a series of qualitative evaluations with potential users and clinicians. Once the beta version of the VPA is sufficiently prepared, the team will pretest the system with potential users and clinicians, make modifications pursuant to findings, and conduct a randomized controlled trial (RCT) with subjects who are at high risk of adverse drug events. The system has now been completed, debugged, and tested with hospitalized patients. The RCT, a test-of-concept trial, began in August 2010. The outcome data will be collected after the first postdischarge appointment with the responsible clinician.

The participants in the randomized trial will be instructed to: 1) check in with the VPA via computer following discharge from the hospital and on a regular basis before the first post-hospital visit; 2) bring to the first post-discharge visit the result of the online interactions, which is a list of items to discuss with the clinician; and 3) meet with the VPA after the ambulatory visit for instructions on any medication regimen changes made during the office visit. The team will evaluate the intervention by comparing process outcomes (i.e., enrollment, adherence, attrition, fidelity, therapeutic alliance, and patient activation) and clinical outcomes (i.e., patient and provider satisfaction, patient knowledge of self-care and medications,
adverse events, and pharmacist interventions) of those using the VPA to outcomes for a usual care group. Concurrently, the team is pursuing dissemination of the VPA by introducing the system to other interested health care organizations.

**Specific Aims:**

- Program the VPA, a computer-based, interactive, animated character, to offer patients with limited health literacy or health education advice on self-care and medication use during the transition from hospital to ambulatory care. *(Achieved)*
- Design and implement an ambulatory care plan using the VPA to educate the patient and respond to questions. *(Achieved)*
- Evaluate the intervention in the ambulatory setting. *(Ongoing)*
- Build a robust dissemination program that will introduce this system into a health care system that is a member of a national test bed. *(Achieved)*

**2010 Activities:** The intervention was launched after significant development, testing, and refinement of the VPA system. The study team continued testing the workstation to identify areas that needed improvement or additions. A variety of clinicians and patients reviewed the system and made recommendations about how the system should be modified. Additionally, testing for the VPA portal included assessment of how information flows from the patient to the clinical team and back to the patient. A codification system was designed to categorize alerts. Additional diagnosis scripts, diagnosis pages, medications, medication scripts, primary care providers, and pharmacies have been added to the existing selections. Integration of the workstation with the Boston Medical Center EMR was completed.

Following extensive testing, the research team began to recruit patients for the RCT. Due to delays with development, the length of time to run the RCT was truncated to 5.5 weeks. A total of 47 patients were randomized; 23 to the control group and 24 to the intervention group.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project milestones and aims are mostly on track, while project spending is on target.

**Preliminary Impact and Findings:** The RCT was completed and data analysis is in progress. The study cohort was followed from discharge until the first appointment with their primary care provider, a time of approximately two weeks. Of these 47 randomized patients, four logged into the system. The four patients logged in an average of eight times each, to generate a total of 31 alerts. Fifty-five percent of alerts were related to a possible side effect. The grant team hypothesizes that patients may have only used the system if they were concerned about their health. Of the 47 users, 17 were re-hospitalized or had an emergency department visit. None of the four users were re-hospitalized or had an emergency room visit.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
An Interactive Preventive Health Record to Promote Patient-Centered Care

**Principal Investigator:** Krist, Alexander, M.D.  
**Organization:** Virginia Commonwealth University  
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)  
**Grant Number:** R18 HS 017046  
**Project Period:** September 2007 – February 2011, Including No-Cost Extension  
**AHRQ Funding Amount:** $1,198,677  
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** While there is clear evidence supporting the health benefits of preventive care, Americans receive only 50 percent of indicated preventive services. A number of patient, clinician, and health care system barriers contribute to this gap in the delivery of quality preventive care.

The objectives of the project are to design, develop, implement, and evaluate whether an interactive preventive health record (IPHR) linked to an electronic medical record (EMR) will increase recommended screening tests, immunizations, and counseling. MyPreventiveCare provides tailored recommendations, links to educational resources and decision aids, and patient and clinician reminders. MyPreventiveCare gives the patient a link to preventive elements of his or her EMR, a health risk assessment, an individualized list of recommended preventive services based on risk stratification, education resources, and reminders. Reminders include messages encouraging healthy behaviors and recommended services, alerts informing patients when they become eligible for retesting or new services, and requests encouraging patients to update their profiles. MyPreventiveCare provides the clinician with a summary of the patient’s risk factor information, which can be used to update the clinician’s EMR.

The study involves eight primary care practices in the Virginia Ambulatory Care Outcomes Research Network. All of the practices use a common EMR, the Certified Commission for Health Information Technology-certified Allscripts Touchworks® EMR. A randomly selected sample of 5,500 of the practices’ 228,000 patients, stratified by age and sex, receive a request from their clinicians to use MyPreventiveCare or receive “usual” preventive care. Through this randomized, controlled trial, the project team is examining the effects of MyPreventiveCare on clinical preventive services, shared decisionmaking, and patient-physician communication. This involves the analysis of data in the EMR, utilization data from MyPreventiveCare, and data collected from patient and provider surveys.

**Specific Aims:**
- Evaluate whether an invitation from a patient’s primary care clinician to use MyPreventiveCare increases use of the system. (Ongoing)
- Evaluate whether an invitation from a patient’s primary care clinician to use MyPreventiveCare increases delivery of age- and gender-appropriate clinical preventive services. (Ongoing)
- Evaluate whether an invitation from a patient’s primary care clinician to use MyPreventiveCare increases shared decisionmaking for preventive services. (Ongoing)
• Evaluate whether an invitation from a patient’s primary care clinician to use MyPreventiveCare improves clinician-patient communication about preventive needs. (Ongoing)

**2010 Activities:** The grant team analyzed baseline and four-month post-intervention data from both the Consumer Assessment of Healthcare Providers and Systems (CAHPS) survey and the EMR. The team also completed the collection of both survey and EMR data for the 16-months post-intervention. In February 2010, the team mailed the preventive services survey to 4,500 predefined intervention and control patients and the CAHPS survey to an additional 1,000 predefined intervention and control patients. They prepared and transferred EMR data on all 5,500 intervention and control patients and, at the end of the calendar year, were in the process of the combined EMR and survey data analysis. The team created a detailed and extensive protocol to address data discrepancies (i.e. when EMR data and survey responses are inconsistent) and merge the datasets. These refined protocols were made consistent with the U.S. Preventive Services Task Force recommendations and the prevention recommendations that MyPreventiveCare promotes to patients.

Analysis of qualitative data included review of focus group transcripts by team members and the use of an immersion and crystallization approach to the analysis to identify key themes. Results are being written for publication. The team completed a presentation of findings at the Agency for Healthcare Quality and Research Annual Conference in September 2010.

In July 2010, MyPreventiveCare was officially recognized by the Centers for Medicare and Medicaid Services (CMS) as a qualified Physician Quality Reporting Initiative (PQRI) reporting registry. Obtaining recognition involved submitting a nomination letter, documenting and justifying the quality measures calculation, getting CMS approval on the data validation process, and demonstrating an ability to submit quality measures in the specified XML format. CMS PQRI approval facilitated the recruitment of six additional study sites for future work.

**Grantee’s Most Recent Self-Reported Quarterly Status (As of December 2010):** Project progress is completely on track, meeting all milestones on time and project spending is roughly on target. The project staff are focused on qualitative data collection and quantitative data analysis.

**Preliminary Impact and Findings:** Within six weeks of receiving the invitation, 292 patients (11 percent) had established an account and used MyPreventiveCare. Users were more often male and older than non-users. Although 76 percent of users had attended a wellness or chronic care visit within the past year, only three percent were up-to-date with risk factors under control for all 18 preventive services (for example influenza vaccination and diabetes screening). Among MyPreventiveCare users, 49 percent and 56 percent were due for screening tests and vaccinations respectively; 91 percent and 55 percent needed counseling for unhealthy behaviors and preventive medications respectively; and 35 percent had inadequate control of chronic conditions. Alerts to clinicians issued by MyPreventiveCare led practices to update 59 percent of patients’ records and to contact patients to schedule a wellness visit (80 patients), chronic care visit (49 patients), or an appointment for a specific preventive service (56 patients).

The team has combined EMR and patient survey data, and completed and cleaned four-month post-intervention data, which is currently being written up for publication. Overall, MyPreventiveCare increased the delivery of all preventive services by 5.4 percent; colon cancer screening by 12.3 percent; breast cancer screening by 16.1 percent; and cervical cancer screening by 12.3 percent, when comparing users to non-users.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use
### Tailored DVD to Improve Medication Management for Low Literate Elderly Patients

**Principal Investigator:** Lapane, Kate, Ph.D.  
**Organization:** Virginia Commonwealth University  
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)  
**Grant Number:** R18 HS 017281  
**Project Period:** September 2007 – September 2010  
**AHRQ Funding Amount:** $1,199,014  
**Summary Status as of:** September 2010, Completion of Grant

**Target Population:** Elderly*, Low Literacy

**Summary:** Medication decisions are the most common type of decision that physicians make, yet the evidence shows that discussions between patients and providers regarding medications remain infrequent in primary care settings. Medication management issues among older patients include high incidence of preventable adverse drug events and noncompliance with medication regimens. Access to comprehensive and accurate electronic medication history provides the opportunity to create tailored interventions based on the particular medication issues a patient may be experiencing.

Dr. Lapane’s research team hypothesized that electronic medication history can be harnessed to develop tailored patient education DVDs and print materials for low-literate audiences. The purpose of these materials is to empower geriatric patients and their caregivers to participate in treatment decisions and negotiate acceptable medication regimens that are more amenable to follow-through. This project focused on developing and testing health information technology (IT) interventions that improve medication adherence and use by patients, shared decisionmaking, patient-clinician communication, and patients’ self-management of chronic conditions. The team developed paper-based and tailored DVD content for low-literate patients, illustrating the principles of medication adherence and providing guidance on medication use so that they can better adhere to complex drug regimens.

The study used a mixed-methods formative evaluation to ensure a representative variety of data are analyzed for the development of the final product. Data sources included: focus groups with patients, providers, and caregivers; electronic prescription data and other sources of data such as the National Health and Nutrition Examination Survey, and other publicly available databases; and telephone surveys with a cross-section of the population. Once developed, materials were confirmed with additional focus groups, and the DVDs and print materials were pretested in a live environment. The research team engaged primary care practices and community centers in a pilot study of the intervention, and 132 patients completed the follow-up activities which included collecting and analyzing information such as demographics, social support, medication profiles, medication management issues, stage of readiness to change, self-efficacy, self-reported adherence, adherence measures based on electronic medication history, and a series of clinical process measures.
Specific Aims:

- Develop algorithms to identify potential medication management issues based on community pharmacy-generated electronic medication history of elderly people in census areas with high concentrations of minorities and poor people. (Achieved)
- Develop tailored print materials based on electronic medication history to assist geriatric patients in adhering to complex medication regimens. (Achieved)
- Develop tailored instructional videos which focus on improving the geriatric patient’s role in patient-provider communication regarding medication issues and adherence to medication regimens. (Achieved)
- Pretest these interventions with versions in English and Spanish as part of a feasibility study within physician offices likely to service low-literate geriatric patients. (Achieved)

2010 Activities: Pharmacists were engaged to help expand medication lists so that they could be integrated with electronic medical record data and the algorithms for identification of potential medication management issues. The team developed the specific algorithms to trigger segments of the DVD. Analysis and testing of the algorithms was completed.

DVDs were finalized in English and Spanish, and were prepared for distribution. All print materials corresponding with the videos were completed, translated into Spanish, printed, and prepared for distribution.

The evaluation was designed and implemented. Surveys were developed, piloted, finalized, and translated into Spanish. The intervention was pilot tested and finalized. The team enrolled participants through community centers in Rhode Island and Massachusetts and primary care practices in Virginia. Nearly eighty-seven percent of persons completing the baseline assessment (n = 146) finished the entire protocol (n = 132).

Grantee’s Most Recent Self-Reported Quarterly Status (as of September 2010): The project was completed in September 2010. All aims and milestones were achieved. An administrative supplement was granted by AHRQ so that the aims could be achieved, and the final budget spending was roughly on target.

Impact and Findings: Virtually all households in the United States have a television, with 8 in 10 also having DVD equipment. While the initial cost of DVD production can be somewhat high, reproduction is inexpensive and has the potential to make accurate information regarding medication management available to diverse populations in a convenient, acceptable, and cost-efficient way. Clearly, different mechanisms are needed to provide information to older adults and low literate adults. The findings of this study support the notion that DVDs are a viable mechanism to provide such information. Another opportunity for provision of medication information is via community pharmacies. The distribution of consumer medication information is effective; however, the content, format, reading level, and excessive length of informational materials is not. The extent to which integration of tailored DVDs for home viewing via community pharmacy is acceptable to older adults with diverse backgrounds remains unknown. Also, before promoting widespread diffusion of this approach, the impact of tailored medication education DVDs on health outcomes needs to be proven in a larger study.
**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of medication information to improve medication management.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Impact of a Wellness Portal on the Delivery of Patient-Centered Prospective Care

**Principal Investigator:** Mold, James, M.D.

**Organization:** University of Oklahoma Health Sciences Center

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care (PCC) Through Health Information Technology

**Grant Number:** R18 HS 017188

**Project Period:** October 2007 – December 2010, Including No-Cost Extension

**AHRQ Funding Amount:** $902,411

**Summary Status as of:** December 2010, Completion of Grant

**Target Population:** Adults, Pediatric*

**Summary:** As the number of recommended preventive services continues to increase, clinicians struggle to maintain a balance between immediate patient concerns and the time required to address prevention. If effective and timely clinical decision support is not integrated into a comprehensive care delivery approach (e.g., the Chronic Care Model), and patient-centered tailoring of recommendations is not incorporated, primary care clinicians’ performance in this area will not improve from the current suboptimal levels—40 to 60 percent rates of delivery of well-accepted preventive services. Optimal delivery of primary, secondary, and tertiary preventive services will increasingly require sophisticated information processing and much greater patient involvement.

This project develops and tests an Internet-based patient-centered Wellness Portal to allow patient access to the Preventive Services Reminder System (PSRS), a pre-existing, internally-developed clinical tool for improving the delivery of patient-centered preventive services. Practices within the Oklahoma Physicians Resource/Research Network (OKPRN) use the PSRS. The PSRS contains a patient registry, preventive service reminders according to evidence-based guidelines, an electronic chart-auditing and patient recall tool for clinical decision support, patient education materials, and a 3-year prospective wellness plan. The project team members have enhanced functionality of the PSRS by allowing patient access via the Wellness Portal, which patients can access through their home computer or provider office kiosks. The Wellness Portal allows patients to securely input personal information on their health behaviors and wellness status in order to personalize their wellness plan through the risk assessment algorithm. In addition, the Portal would allow patients to securely contact their provider and schedule visits, transfer their wellness record to other providers using the Continuity of Care Record interface, and review educational materials.

The Wellness Portal project enrolled guardians of children (6 years old and younger) and adult patients (50 years or older) at four clinician practices within a primary care practice-based research network in Oklahoma. The research team conducted a 12-month randomized controlled trial with four intervention and four control OKPRN practices to elucidate whether the Wellness Portal improves the delivery of appropriate preventive services at the right time; increases patient experience with patient-centered care; enhances patient activation; and improves delivery of preventive services controlled for the level of utilization, patient demographics, and health status.
Specific Aims:

- Develop, field test, and refine an Internet-based patient Wellness Portal linked to PSRS to facilitate patient-centered, preventive care in primary care practices. (Achieved)
- Determine the impact of the Wellness Portal on the process of patient-centered preventive care by examining the behavior and experiences of both patients and providers, and the degree to which recommended services are individualized. (Achieved)
- Develop model Wellness Portal practices, and disseminate the Wellness Portal technology and knowledge derived from findings from the first two aims. (Achieved)

2010 Activities: The participating practices were visited to provide assistance, as required, to make the Wellness Portal available to patients at the practice site and through home computers.

The team continued development of presentation materials and work on articles for publication in peer-reviewed journals. Dissemination activities have resulted in the development of several brochures to encourage patients and practices to make the Wellness Portal a part of routine patient care. In addition to these dissemination activities, the project contracted with a public relations firm to provide additional brochures for patients and clinicians, posters for clinicians’ offices, and a Web page design to facilitate electronic distribution.

During 2010, the project’s primary focus has been on continuing the intervention and collecting data. Post intervention data was collected at each of the eight sites through chart audits. Data has been cleaned and most analyses completed. Each of the providers in the intervention practices was interviewed to understand his or her perspective regarding the project impact. These interviews were digitally recorded and transcribed, and will be analyzed using coding procedures supported by NVivo software.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Project progress was on track, with all aims were completed. The team completed data collection and analysis and when the grant ended, the team was in the final stages of writing up final results, including submission of manuscripts to peer reviewed journals.

Impact and Findings: Preliminary data with a sub-set of the final data showed significant improvement in preventive services in the intervention practices compared with control practices. An article describing the preliminary data analysis has been produced and is now in press. Additional findings will be presented in forthcoming manuscripts.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use

* AHRQ Priority Population
Patient-Centered Informatics System to Enhance Health Care in Rural Communities

**Principal Investigator:** Samore, Matthew, M.D.
**Organization:** University of Utah
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)
**Grant Number:** R18 HS 017308
**Project Period:** September 2007 – September 2011, Including No Cost Extension
**AHRQ Funding Amount:** $1,199,999
**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Chronic Obstructive Pulmonary Disease, Diabetes, Heart Disease, Hypertension, Rural Health*

**Summary:** This is a demonstration project to evaluate whether integrating the functions of an electronic medical record (EMR), personal health record (PHR), and communication system leads to more patient-centered care in rural communities in Utah. This system, the Unified Health Resource (UHR), provides disease information and decision support tools for patient self-management of acute and chronic diseases; supports the reconciliation of medication lists; and enables exchange of information between clinicians and patients through a series of structured, bidirectional communication channels.

The EMR and PHR function independently of each other. The UHR software developer, CaduRx, designed an interface that allows each side to view and import changes to reflect the updates made by the other party. Patients may view items such as physician notes, diagnoses, and diagnostic test results in their PHR. Physicians, who are granted access by the patient, are able to view and import the patient’s information from the PHR into their EMR which may include new prescriptions, symptoms, or diseases. In addition, there are several types of structured e-visits patients can use to communicate with clinics and clinicians. Patients may request medication refills online as well as input results of home monitoring tests into their PHR, such as blood sugar levels and blood pressure measurements. Through extensive usability testing, the project team has ensured that the vocabulary used in the PHR is understandable to the patients, clinically significant to the providers, linkable to International Classification of Diseases, Clinical Modification codes, and able to be coded for clinics’ record keeping and billing purposes.

To assess the effect of the UHR on patient-centered care, the team is conducting a prospective cohort study among adult patients at one of the clinics that use the UHR. Participants were recruited so 25 percent do not have a chronic disease diagnosis and 75 percent have one or more of the following chronic illnesses: diabetes mellitus, hypertension, chronic heart disease, or chronic obstructive pulmonary disease. Measures of patient activation, involvement in decisionmaking, self-management behaviors, medication management, and preventive practices are obtained at baseline and during followup. The team will also analyze data abstracted from the UHR, and conduct a manual review of the patients’ medical records to compare the provider assessment of patient disease management to the patient’s self report. A formative evaluation of the UHR is being conducted to assess and improve usability, usefulness, and adoption.
Specific Aims:

- Recruit two rural primary care clinics that use UHR and two primary care clinics that use an alternative, non-UHR EMR system to participate in a 3-year research demonstration project. (Achieved)
- Apply formative evaluation methods to assess and improve usability, usefulness, and adoption of the UHR personal health system by patients. (Ongoing)
- Enroll patients from the four participating rural clinics into a prospective cohort study to assess the impact of the UHR personal health system on patient-centered care. (Achieved)
- Examine patterns of use of the UHR personal health system. (Ongoing)
- Increase awareness, confidence, and skills to use PHRs and Internet health resources among rural community residents, leveraging local libraries and health departments. (Achieved)

2010 Activities: The team continues to evaluate the level of adoption of the UHR in the study clinics in order to identify and respond to the needs of each clinic. This includes monthly clinic visits as well as training to support integration of the EMR into clinic workflow. The project team also helps clinic staff understand the benefits of the PHR, which has been challenging because this technology is a relatively new concept for them. These efforts to promote integration and educate providers will put the clinics in a better position to promote the UHR among their patients and increase the satisfaction and adoption among those patients who use the UHR. The team also continues to promote patient engagement with the UHR by emailing patients about features of the system and encouraging providers to discuss the system with patients as well as placing materials in the clinics to remind patients of the tool and its features.

The data collection phase of the study is complete. A two-part patient survey was administered to users of the UHR to determine experiences with the system as well as communication with their provider. A survey for minimal and nonusers was developed and administered. Thirty completed surveys were collected from each of the clinics using the UHR. The team continues to work on determining what constitutes an effective or ideal pattern of use for the PHR and EMR, as well as an inefficient pattern of use. This determination will be helpful in identifying factors that lead to adoption of the tool. Along these lines, the research team is working with the Consumer Assessment of Healthcare Providers and System Program to develop benchmark data and assess their data against national standards.

The team planned a community-wide outreach, including health education classes, involving local health departments and public libraries, on using the PHR. The local departments of health and public libraries were less receptive than anticipated; therefore, the project team focused efforts on patient outreach within the participating clinics. Patient education included information about their health and medical conditions.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is mostly on track and project spending is on target. The research team continues to evaluate the level of adoption of the UHR in the study clinics and to encourage patient engagement in the system.

Preliminary Impact and Findings: An analysis of patient usage and rating of UHR components seeks to identify the components of the system that were ranked most favorably and may have ultimately driven patient adoption of the system. Preliminary analysis indicates that the medication refill, reconciliation functions, the drug safety, and adverse event components were the most frequently accessed and most favorably reviewed. The e-visit component of the system, however, was not favorably reviewed. Through recruitment of patients from the participating clinics for the usability testing, the team has discovered,
anecdotally, that patients are very interested in the idea of a PHR linked with their health care provider and to their clinic records. The challenge is to make sure patients are aware of how the tool is integrated with the clinic and understand how to use it successfully. Clinic staff, including providers, need to be well informed about the UHR and understand its utility and potential to produce increased office efficiency and improved patient outcomes.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use

* AHRQ Priority Population
**Harnessing Health Information Technology for Self-Management Support and Medication Activation in a Medicaid Health Plan**

**Principal Investigator:** Schillinger, Dean, M.D.

**Organization:** University of California, San Francisco

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care Through Health Information Technology (PCC)

**Grant Number:** R18 HS 017261

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,130,769

**Summary Status as of:** December 2010

**Target Population:** Adults, Diabetes, Elderly*, Low Literacy, Low SES/Low Income*, Medicaid, Medically Underserved, Medicare, Racial or Ethnic Minorities*, Safety Net, Uninsured

**Summary:** The Self-Management Automated Real Time Telephone Support (SMART-Steps) Program enhances an automated telephone self-management (ATSM) support system to provide ethnically diverse, publicly-insured patients who have diabetes with surveillance and education, and to prioritize additional telephone care management through questions on patient behavior. This work builds on a previously-funded Agency for Healthcare Research and Quality (AHRQ) project by implementing modifications to adapt the program for sustained use. Through a randomized controlled trial, the project team is examining the effects of the intervention among SMART-Steps Program participants from the San Francisco Health Plan (SFHP), a Medicaid plan using a quasi-experimental study design. Enrolled patients are randomized to the ATSM-only group (SMART-Steps ONLY), the ATSM-plus group (SMART-Steps PLUS), or the usual care comparison group, that will subsequently receive ATSM-only or ATSM-plus services. In the SMART-Steps ONLY model, patients will respond to a rotating set of questions on self-care, psychosocial aspects of care, and receipt of preventive services. Patients with an answer that is “out of range” on an item receive an immediate automated health education message. Patients with an answer “significantly out of range” receive the automated message plus a followup person-to-person call from an SFHP care manager. In addition to those services, the SMART-Steps PLUS model has supplementary phone communications from the ATSM care manager to the patient triggered by data derived from pharmacy claims and a diabetes registry. These calls provide further education about medication adherence based on clinical criteria developed by a clinical advisory board.

The team is conducting patient surveys to analyze outcomes such as perspectives on the structure of their care and the interpersonal processes of care. To analyze patient safety, the team is exploring characteristics of adverse events: triggers, frequencies, their nature, preventability or ability to be ameliorated, and clinician awareness. To analyze effects of the intervention on relevant metabolic and clinical process and outcome measures, the team is using electronically-available clinical and administrative data.

**Specific Aims:**

- Measure the effects of a Medicaid health plan-directed ATSM on patient-centered outcomes among ethnically-diverse health plan enrollees with diabetes. (Upcoming)
• Explore whether combining ATSM with an additional patient-directed health information technology innovation—a medication activation communication strategy triggered by pharmacy claims data—yields differential effects on patient-centered outcomes compared to ATSM alone. (Upcoming)

• Quantify and characterize patient safety events triggered and/or identified through active surveillance among ATSM participants. (Upcoming)

• Measure differences in the frequency and nature of patient safety events among participants receiving ATSM-only versus ATSM-plus medication activation. (Upcoming)

• Explore the effects of ATSM interventions on Healthcare Effectiveness Data and Information Set (HEDIS)-relevant metabolic and clinical process and outcome measures when compared to usual care. (Upcoming)

• Explore whether ATSM-plus medication activation is superior to ATSM-only with respect to HEDIS-relevant metabolic and clinical process and outcome measures. (Upcoming)

2010 Activities: The SFHP continued to enroll health plan members in the SMART-Steps Program to work toward the goal of 500 diabetic participants. A total of 347 Cantonese-, English-, and Spanish-speaking participants enrolled in SMART-Steps as of December 31, 2010. Subsequently, 334 enrollees agreed to partake in the University of California, San Francisco (UCSF) evaluation of SMART-Steps: 167 Cantonese-, 104 English-, and 63 Spanish-speaking participants. Of these, 268 baseline interviews (80 percent) are complete. A total of 249 first-time follow-up interviews are complete (75 percent), with the remaining participants scheduled. Furthermore, 96 of 128 eligible participants (75 percent) completed their second interview. To date, recruitment is behind schedule. To mitigate this, the recruitment center has added additional evening recruitment sessions. Participant data are entered into a UCSF computer-assisted telephone interview instrument to enable real-time reporting of recruitment efforts, and preliminary cross-sectional interim analyses.

The team is working closely with SFHP outreach and care management staff in a consultative and supportive role. Support has included: monitoring quality assurance of care manager efforts; facilitating communication between SFHP staff and community provider sites; ensuring accurate interpretation of daily and weekly data reports; and promoting secure monthly data exchange between the Community Health Network diabetes registry and the SFHP staff to allow SFHP to identify potentially-eligible SFHP members. The team is also monitoring the fidelity of the participant randomization process, the wait-listing procedures intrinsic to the quasi-experimental design, and the care management protocols.

Dr. Schillinger’s team plans to perform detailed analyses of the claims-based data collected by SFHP to enable development of consistent methods to accurately characterize measures related to monthly refill nonadherence. This will enable future analysis of the effects of the SMART-Steps PLUS medication intensification arm relative to the SMART-Steps ONLY arm. The team also plans to perform real-time assessments of potential and actual adverse events identified through the surveillance function of the SMART-Steps program, to enable the future analysis of the effects on patient safety of the SMART-Steps PLUS medication intensification arm relative to SMART-Steps ONLY arm. They will also begin a pilot process related to root cause analysis work that will be undertaken with a subset of SMART-Steps patients and primary care physicians. The team has now initiated data analysis to determine best measures for fidelity assessment.
Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): SMART-Steps enrollment is behind schedule and as a result, the project is significantly under spent. The grantee has received a no-cost extension and intends to meet the target recruitment goal. The grantee is collaborating with the external call center to improve recruitment and is working in close consultation with AHRQ on plans for completion of the project.

**Preliminary Impact and Findings:** This project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Enabling Sleep Apnea Patient-Centered Care via an Internet Intervention

**Principal Investigator:** Stepnowsky, Carl, Ph.D.

**Organization:** Veterans Medical Research Foundation

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)

**Grant Number:** R18 HS 017246

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,155,062

**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Poor treatment adherence with continuous positive airway pressure (CPAP) therapy is well-documented. This project develops an integrated remote monitoring device and Internet-based portal for patients with obstructive sleep apnea syndrome (OSA) who are prescribed CPAP treatment. The project will evaluate the intervention’s effect on patients’ experience of care, CPAP adherence, and OSA outcomes.

OSA is a common sleep apnea and is caused by obstruction of the airway. It is treated with a CPAP flow generator, a machine that blows air at a physician-prescribed pressure into a facemask or nasal pillow. The team used the ResMed-developed Restraxx Data Center (RDC), a Web site that obtains data from the CPAP flow generator via a wireless monitoring module that affixes directly to the CPAP unit. The objectively-measured adherence data from the RDC will be transmitted to both patient and provider and used as the central outcome measure to evaluate the intervention. The provider portal contains information including adherence, amount of air leaking, and number of apneas or hypopneas per hour. With this information, the provider can continuously monitor the patient’s progress and make ongoing decisions about how to support the patient and/or alter his or her treatment plan.

The team organizes the data provided by the RDC into user-friendly pieces of information which are then provided to the patient through the Internet Positive Airway Pressure (i-PAP) patient portal. In addition, the portal contains tailored measures that patients can observe and allows them to add self-defined measures. The portal has a learning center with information on sleep apnea and the CPAP device, charts that provide objectively-measured adherence and efficacy data, self-tracked changes in weight, sleepiness, physical activity, and other user-defined factors over time. The learning center also contains self-assessment materials, including research surveys and a journal for self-documentation, a message board with a support network for CPAP users, and links to external sources of information on sleep apnea.

The project will conduct a randomized controlled clinical trial to evaluate the effects of the interactive portion of the CPAP treatment. Both the usual care group and the i-PAP patients will be provided with CPAP devices and education materials on OSA. The trial will evaluate the effect of having the Internet-based portal to facilitate the flow of information and communication between providers and patients in addition to the CPAP device. The team will evaluate whether and how the i-PAP intervention affects OSA-related outcomes, CPAP adherence, patient-centeredness of care, patient assessment of and satisfaction
with care, and patient activation. In addition, the team will examine indicators such as use of the Web site and frequencies and the nature of clinical contacts to understand the reasons behind any effects.

**Specific Aims:**

- Examine the effect of the i-PAP intervention compared to usual care on the patient’s experience of the quality of patient-centered, collaborative care. *(Ongoing)*
- Examine the effect of the i-PAP Internet intervention compared to usual care on the level of CPAP adherence. *(Ongoing)*
- Examine the effect of i-PAP compared to usual care on OSA outcomes. *(Ongoing)*
- Perform a basic cost analysis of the i-PAP intervention compared to usual care, applying a micro-cost methodology of measuring the quantity of inputs used in the production of care and the unit cost of each. *(Ongoing)*

**2010 Activities:** The project online assessments were created and subjected to extensive validation procedures to ensure that the paper version of the questionnaire be accurately portrayed in the Web-based version. The validation procedures included verification of each item, the allowable responses, the flow and order of the questions within the questionnaire, the accuracy of the changes in items across baseline, post-intervention, followup visits, and troubleshooting of any problems when the test subjects took practice versions of the online testing. Online questionnaires were improved in several ways: font size was increased for readability; “hit” zones were enlarged to make response selection easier; online questionnaires were divided into two parts to allow a sense of completion for those who might find the survey lengthy; and an added progress bar at the top of the page for those wished to monitor relative time until completion. Once the online surveys were created, they were integrated to the Web site for patients, and a research administration page was created to allow project staff to track participants who were due to complete surveys and those who already completed them.

The basic flow of recruitment, enrollment, and intervention, along with assessments, are firmly in place. The Web site design is essentially complete. The team continues to consider adding functionality to the Web site in two areas and continues to review and update troubleshooting guide.

The team continued to work on cleaning the CPAP data. For various reasons some research participants ended up with more than one data download, so the team combined the excel files so there was one file per subject. The project had 210 CPAP data downloads at the time of the last report, 14 of which needed to have the data aggregated. Hand manipulation was required and double-checks were integrated into the process. In addition, the team attempted to reduce the higher-than-expected rates of uncompleted data on the questionnaire. Efforts to schedule more in-office appointments and maintain better contact helped maintain a 20 percent or higher questionnaire completeness rate.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is mostly on track. Budget spending is roughly on target.

**Preliminary Impact and Findings:** A review of sleep apnea and CPAP Web sites identified more than 90 Web sites. The team coded 49 of them for descriptive and evaluative variables. The project team is reviewing the information for type of interactivity. Fewer than five Web sites had any interactive content and only one had graphical interactive content. Patients who engaged in the clinical aspect of the project are not as compliant with the Web-based assessment as would have been expected. The study team is
expecting to implement strategies to improve the 25 percent attrition rates.

Several manuscripts and book chapters were initiated and are expected to be published in 2011.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Patient-Centered Online Disease Management Using a Personal Health Record System

**Principal Investigator:** Tang, Paul, M.D.

**Organization:** Palo Alto Medical Foundation

**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care (PCC) through Health Information Technology

**Grant Number:** R18 HS 017179

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,158,401

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Diabetes

**Summary:** Diabetes is a major, growing, and costly chronic disease in the United States; yet, implementation of recommended diabetes care is suboptimal and inconsistent for a sizable proportion of affected Americans. In an effort to reduce the treatment and adherence gaps in diabetes care, this study is evaluating an online disease management system that actively supports a partnership between the patient and his or her multidisciplinary care management (CM) team. This program will provide a platform for online disease management (ODM) for many different chronic conditions in a range of ambulatory care settings.

The CM team includes a nurse diabetes care coordinator, a clinical pharmacist, a nutritionist, and the patient’s physician(s). The ODM system is integrated with Epic Systems’ EpicCare, a comprehensive, Certification Commission for Health Information Technology-certified electronic health record (EHR) system that includes a personal health record (PHR) and secure patient-clinician messaging capabilities. Patients of the Palo Alto Medical Foundation (PAMF) have access to an integrated PHR called PAMFOnline, which is a customized version of Epic Systems’ MyChart PHR. PAMFOnline provides patients with: a health summary from their EHR (diagnoses, medications, allergies, laboratory test results with physician annotations, immunizations, and a health maintenance schedule); physician-endorsed information resources about health topics; the ability to request a prescription renewal or appointment; a list of pending appointments and laboratory orders; and private notes, which patients enter themselves and are not visible to the clinical staff. In addition, patients can communicate electronically with their health care team.

Using a specially-designed wireless adaptor that attaches to their glucometer, patients can upload their glucometer readings to their PHR. Once logged onto PAMFOnline, they can view the information graphically and correlate their glucose trends with other information about their health behavior (e.g., diet, exercise, medication use). Utilizing the shared action plan developed specifically for each individual, the patient works with the CM team, primarily via online communication, to adjust medications or make further lifestyle changes. Custom-tailored “nuggets” of patient education and advice are “dispensed” to a patient based on his or her specific clinical situation (e.g., responding to uploaded glucose readings, nutrition logs, test results, or patient questions). These “nuggets” can be personalized text, videos, graphs, or hyperlinks on topics such as hypoglycemia, controlling food portions, and exercise. The project team
also provides a diabetes summary report that consolidates all of a patient’s relevant diabetes information into a single report. Importantly, the report correlates the patient’s specific action plan with their risk of major complications (e.g., stroke, kidney failure, heart attack, blindness) from diabetes.

The project team is evaluating the ODM program for diabetes in a randomized, controlled trial (RCT) of patients at PAMF who have inadequately-controlled type 2 diabetes, defined as hemoglobin A1c (HbA1c) greater than 7.5 percent, and do not have severe complications. The primary hypothesis under evaluation is that patients in the intervention arm will have lower HbA1c at 12 months post-randomization than those receiving usual medical care. Secondary hypotheses are that the intervention will be associated with: improved self-management practices such as medication adherence, home monitoring of glucose and blood pressure, healthy diet, and regular exercise; improved biologic measurements such as blood pressure and lipids; better processes of care such as frequency of monitoring tests, lower cardiovascular risk, enhanced patient experience, and satisfaction with care; and improved patient psychosocial well-being. These measures will be assessed in both groups by laboratory testing; EHR data extraction; and an online questionnaire at baseline, 6 months, and 12 months post-randomization.

**Specific Aims:**

- Refine the Personalized Health Care Program platform with a particular focus on enhancing the customization capability of the ODM system and ensuring a seamless incorporation of ODM into the workflow of clinicians on the CM team and with the self-management process of patients. *(Achieved)*
- Evaluate the ODM program for diabetes relative to usual medical care, in a two-arm RCT. *(Ongoing)*
- Disseminate results of the RCT in the scientific literature, and deploy the PHCP program in PAMF and other ambulatory care settings for use with diabetes and other chronic conditions. *(Upcoming)*

**2010 Activities:** The primary focus during this period has been data collection and analysis. The research assistants continued to meet with patients passing their 6-month and 12-month anniversary and conducted the appropriate data collection activities.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is completely on track, meeting all milestones on time. The primary focus this period has been on data collection and analysis. Project spending is roughly on target.

**Preliminary Impact and Findings:** Early testing showed that patients valued their relationship with the nurse diabetes care coordinator and the comprehensive patient-specific risk information in the diabetes summary report. Patients also found online messaging to be a convenient, efficient alternative to phone calls. Patients commented that the manual entry of glucometer and health behavior data provided valuable insights about changes in their glucose readings in relation to their dietary intake and physical activity. Following the initial learning period, they valued the efficiency gained through wireless uploading of glucose readings, which made it easier for them to sustain measuring and uploading readings on a regular basis.

As of the end of the calendar year, 370 of 405 (91 percent) patients passing their 6-months anniversary and 350 of 405 (86 percent) patients passing their 12-months anniversary have completed both the research assistant visit and questionnaire. Of the 55 patients for whom the research assistant are still pursuing to complete their data collection (questionnaire, biometrics, lab work), 18 have passed the deadline set for the 12-month recording of HbA1c. In addition to these 18 individuals, 10 formally dropped out of the
study. Consequently, the current attrition rate is 28 (7 percent), which remains within the assumed 15 percent attrition rate. There are data for the primary outcome variable (HbA1c) for 376 of the 415 total patients enrolled (91 percent).

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Using an Electronic Personal Health Record to Empower Patients With Hypertension

Principal Investigator: Wagner, Peggy J., Ph.D.
Organization: Georgia Health Sciences University
Mechanism: RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care Through Health Information Technology (PCC)
Grant Number: R18 HS 017234
Project Period: September 2007 – August 2011, Including No Cost Extension
AHRQ Funding Amount: $1,181,369
Summary Status as of: December 2010

Target Population: Adults, Chronic Care*, Hypertension

Summary: Patient- and family-centered care (PFCC) represents a new paradigm for health care delivery, where patients and their families take an active role in their health care management and decisionmaking. Evidence shows that PFCC improves outcomes including reduction of medication errors, increased compliance, and better disease management. However, implementation of patient-centered care in the ambulatory setting remains elusive for most U.S. clinical practices. An electronic personal health record (ePHR) helps overcome barriers to adoption of PFCC by maximizing patient-clinical collaboration, self-management, and related health outcomes.

The project examines the feasibility, acceptability, and impact of an ePHR for patients with hypertension. The project is using Cerner Health’s ePHR, My HealthLink, under the Medical College of Georgia (MCG). To foster personal wellness and chronic condition management, My HealthLink allows consumers to log entries into their ePHR, track progress against their customized care plan, complete health assessments, communicate securely with their providers, access health education content, and check for interactions between medications.

The project team worked with Cerner to iteratively modify My HealthLink to customize it for their local use. The team incorporated the experiences, perspectives, and insights of patients and their families in the design of the ePHR. Patients were enrolled from the MCG Medical Center and researchers conducted two iterative pilot beta tests to evaluate the modified ePHR. Each beta-test session had participants use the ePHR for two weeks. Subsequently, acceptability interviews were conducted and identified themes emerged from the feedback received. Once the modifications suggested by the beta-test participants are fully incorporated, a clustered, randomized controlled trial to compare a group using My HealthLink with those receiving usual care will be conducted. The effectiveness of My HealthLink will be evaluated through questionnaires and biological measurements, including: patient activation and perception of care; biological markers, specifically blood pressure, body mass index, and lipid levels; collaborative patient-physician communication; congruence of medication treatment with guidelines; and frequency-of-use of medical services. The team will also evaluate, via surveys and in-depth interviews, physician and staff perceptions of the ePHR and attitudes towards patient- and family-centered practices.

Specific Aims:
• Improve the application of PFCC elements in an existing ePHR system. (Achieved)
• Implement and test the effectiveness of the revised ePHR (My HealthLink) with patients who are being treated for hypertension by a team of physicians, mid-level practitioners, nurse clinicians, and support staff in two ambulatory settings. *(Achieved)*

• Monitor the shift in provider and support staff awareness and incorporation of PFCC concepts as a result of the implementation of the ePHR. *(Ongoing)*

**2010 Activities:** Two types of patient visits were audio recorded during this period for qualitative data collection. The first type is patient-physician communication recordings in which the actual medical visit is recorded and the second type is the end of the study interview visit with study participants. A total of 51 patient-physician communication visits and 126 Visit 4 end of study interviews were recorded, all of which have been transcribed and will undergo qualitative analysis. Patient follow-ups for visits 2, 3, and 4 were completed during 2010.

Post-trial interviews with participating physicians and staff are complete. A total of eight physicians completed the post-study structured interview and physician perspective of patient empowerment scale (PES-P). Additionally, four staff and nurse focus groups with a total of 14 participants were conducted. A qualitative analysis of the structured interviews and focus groups began as well as an analysis of the post trial PES-P data.

The 2010 culture survey was disseminated in July 2010 (sample= 2,500) and was open until mid-August 2010. Seven hundred, sixty-two people responded and started the survey and 550 completed the survey. Data are being analyzed and will be compared with the 2005 and 2008 culture surveys. In addition, a total of 355 charts were audited by the end of the 2010. Data from the chart audits were entered into a database, have under gone preliminary analysis, and will be used accordingly in the final main trial data comparisons and dissemination of results.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress and spending are mostly on track. The project is progressing as expected, focusing on continuing implementation activities, collecting, and analyzing data.

**Preliminary Impact and Findings:** No impacts or findings have yet been reported.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Using Information Technology for Patient-Centered Communication and Decisionmaking about Medications

**Principal Investigator:** Wolf, Michael, Ph.D.  
**Organization:** Northwestern University  
**Mechanism:** RFA: HS07-007: Ambulatory Safety and Quality Program: Enabling Patient-Centered Care through Health Information Technology (PCC)  
**Grant Number:** R18 HS 017220  
**Project Period:** September 2007 – August 2011, Including No Cost Extension  
**AHRQ Funding Amount:** $1,199,997  
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Medication errors are a major source of patient injury, hospitalization, and death. Medication management in primary care is extremely complicated, given the continually expanding array of available therapies, fragmentation of care, proliferation of information sources, and numerous obstacles experienced by patients (e.g., cost). This study integrates interventions that target patients, providers, and the overall practice system in an effort to improve the medication management process.

The overarching objective of this multicomponent intervention is to develop a protocol to reconcile medications through the phases of the patient-provider clinical encounter. The project provides patient education materials and medication lists that are automatically extracted from the Certification Commission for Health Information Technology-certified Epic Systems’ electronic medical record (EMR), EpicCare. Patients receive the materials in advance of their physician visit at the multispecialty primary care center. Patients then review the medication information contained within the system, indicating if there are any discrepancies or if they have any related questions or concerns. The nurse reviews the patient-provided information and places the output into the rooming sheet for the physician. The system encourages physicians to engage in shared decisionmaking by including prompts for eliciting questions and concerns as well as tailoring treatment plans to match patients’ needs and abilities. The physician will then clarify any issues with the patient and update the patient’s medication list in the EMR. If a new medication is prescribed, the system will generate a plain-language medication information sheet for the patient. The information sheet is automatically generated through project-developed “dot phrases” (system macros that automatically fill in descriptive text prompted by key words) in the EMR, an enhancement to the existing functionality of the Epic EMR.

The clustered, controlled clinical trial will be randomized at the “pod” level to reflect the clinic’s organization into four areas (pods) with separate nursing staff and physicians. Through post-visit interviews and data extracted from the EMR, the project will assess post-visit discrepancies in the medication list, the patient’s functional understanding of their medication regimen, questions on adherence and safety, and a series of process measures to assure that the intervention is translatable to other organizations.

**Specific Aims:**

- Develop and test a multimedia program (which has been since revised to an educational print piece)
to help patients understand the importance of both giving and receiving accurate information about medications (pre-visit patient intervention). \textbf{(Achieved)}

- Use the EMR to encourage patient-centered medication management and extend the EMR medication management capability by training nurses to engage in a patient-centered review of current medications immediately before a patient sees the doctor. Leverage the EMR by developing a template that physicians can easily access to engage in a patient-centered discussion about new medications under consideration. \textbf{(Achieved)}

- Work with the practice-based research network to disseminate and track the use of effective interventions, and create pathways for facilitating national distribution to other practices. \textbf{(Ongoing)}

\textbf{2010 Activities:} The team continued to engage in discussions with the Information Technology (IT) Leadership Team and General Internal Medicine practice directors to discuss options for pre-populating the EMR with medication information sheets and how they will be used by the physicians during the intervention. The study team also utilized health literacy experts to provide interim and final feedback on content and format. Once completed, the medication information sheets were pre-populated into the EMR by the IT team.

A second pilot test was completed in January 2010 with two physicians and feedback was collected from the physicians to refine the intervention. A training session was performed at a physician meeting and followup e-mails were sent out to clarify any concerns. A trial run of the intervention was implemented in February 2010 to work out final problems and address physicians’ concerns before starting recruitment.

The team modified the intervention so patients could receive the educational print folder at the end of their visit. The previous protocol had patients obtain this folder when they checked in for their visit and many patients lost or misplaced it by the end of the visit.

Data collection for the medication reconciliation portion of this study started in February and was completed in July. A total of 163 patients were recruited; 88 control and 75 intervention. The data are currently being analyzed. Data collection for the patient knowledge portion of this study began in December 2010 and will take approximately 6 months to complete.

\textbf{Grantee’s Most Recent Self-Reported Quarterly Status (as of December, 2010):} Progress is mostly on track and the project is meeting most of its milestones. Project spending is roughly on target.

\textbf{Preliminary Impact and Findings:} One hundred and forty-four patients were enrolled with 69 in the control group and 75 in the intervention group. An additional 19 patients were excluded from analysis because they were seen by residents. Overall, 85 percent of patients had some type of discrepancy in their EMR medication list; however, no significant differences were found between the control and intervention groups in overall discrepancies. Types of discrepancies have been broken down to omissions, such as medications taken that are not on their list; commissions, such as medications on their list that they are not taking; and duplications. Overall, 18 percent of patients had at least one omission, 44 percent had at least one commission, and 29 percent had at least one duplication. No significant differences were found between control and intervention groups in type of discrepancy. The current medications evaluation study data are still being analyzed.

\textbf{Strategic Goal:} Develop and disseminate health IT evidence and evidence-based tools to support patient-
centered care, the coordination of transitions across care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Using Precision Performance Measurement to Conduct Focused Quality Improvement

Principal Investigator: Baker, David, M.D.
Organization: Northwestern University
Mechanism: RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)
Grant Number: R18 HS 017163
Project Period: September 2007 – August 2011, Including No-Cost Extension
AHRQ Funding Amount: $1,199,415
Summary Status as of: December 2010

Target Population: Adults, Chronic Care*, Diabetes, Heart Disease, Hypertension

Summary: Measures that utilize data collected for administrative use, such as billing data, inevitably have inaccuracies at the individual patient level. A quality measure may be recorded as not having been met because a patient was incorrectly considered to be eligible or refused the intervention, or because the appropriate data were not captured. As a result of these limitations, clinicians may in truth reach their quality benchmark targets, but automatic reporting of measures pulled from administrative data fail to accurately reflect this. Imprecise measurement methods can never be the foundation for a health care system that delivers near 100 percent high-quality care for chronic disease care and prevention. Quality measurement needs to be embedded within electronic health record (EHR) systems and become dynamic, accurate, and detailed to support the highest level of care possible for all patients.

This project creates systems that allow clinicians to capture reasons for not providing care as part of point-of-care clinical decision support reminder systems, improve data quality, and seamlessly link data to practice-level quality improvement programs and point-of-care interventions. The project uses previously developed quality measurement programs that examine EHR data to measure quality of care for coronary artery disease, heart failure, diabetes, hypertension, and preventive services. This study began at a large academic internal medicine practice and is now being implemented in four community practices that use the same Certification Commission for Health Information Technology-certified EHR, produced by Epic.

Exception codes are being introduced into the EHR for 18 national quality measures. Data are extracted from the EHR every month to assess changes in the primary outcome: the proportion of eligible patients who do not satisfy a measure and do not have any exclusion criteria documented. The statistical significance of changes will be assessed with time series analysis. In addition, physicians will be repeatedly surveyed on their attitudes toward the interventions described in the aims listed below. Outcomes of the quality improvement activities will be monitored along with the costs of the intervention. This study will produce computerized tools and educational materials that can be provided to more than 1,000 sites that use the Epic EHR ambulatory product.
Specific Aims:

- Integrate simple, standard ways for clinicians to document patient reasons or medical reasons for why quality measures are not met and assess the use of these exception codes, the impact of exception reporting on measured levels of quality, and the impact of using these codes on physician satisfaction and self-reported efficiency. (Ongoing)

- Use the exception codes (patient reasons and medical reasons) that clinicians enter to target three forms of quality improvement, including: 1) peer review of all medical reasons for not adhering to guidelines followed by academic detailing if a clinician enters an unjustified reason for not following guidelines; 2) counseling for patients whose physician enters an exclusion code stating that the patient cannot afford a needed medication to determine ways of overcoming barriers; and 3) educational outreach to all patients who refuse recommended interventions, including mailing of plain-language health education materials or DVDs. (Ongoing)

- Provide clinicians with highly accurate information on patients’ quality deficits immediately prior to their visit as part of routine workflow, and assess whether this intervention increases provision of recommended therapies and tests and documentation of exclusion codes. (Ongoing)

2010 Activities: Implementation at the Northshore site significantly progressed. The site was able to implement the clinical decision support and reminder tools in the EHR for select conditions, and generated individual physician and group-level quality reports that included the data on entered exceptions. Data has been generated for the time series studies to analyze changes in quality of care over the course of the study as measured by increases in patients receiving the service, documentation of exceptions, or a combination of both. Further preparation of the data for the time series studies continued beyond the end of the year. Initial reviews of the validity of the entered medical exceptions have been completed which have shown a high level of validity for entered exceptions, only slightly below that seen at the Northwestern site.

Analyses of the effects of the pre-encounter quality deficit reminder system were completed. Although quality of care continued to improve during this second year of the intervention, the pre-encounter notification system did not appear to engage those physicians who were not frequently using the electronic clinical decision support tools. However, the physician survey suggested that doctors liked it, so it has been continued. The study team began to write up these results.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project’s progress is reported as completely on track and is meeting 100 percent of its milestones on time. Project spending is roughly on target.

Preliminary Impact and Findings: For the first aim, the primary outcome of ten measures significantly improved more rapidly the year after implementation than during the prior year. For four other measures, quality improved, but the rate of improvement did not differ significantly from the year prior to the intervention. One measure improved at a significantly slower rate, and the performance of mammography declined due to new barriers to access at the study site. Improvements resulted from increases in patients receiving the service, documentation of exceptions, or a combination of both. By the end of the first year, for five drug prescribing measures, over half of physicians achieved 100 percent performance.

For the second aim, 6.5 percent of the quality reviews identified an issue requiring feedback from an investigator to a clinician, who then entered a medical exception. In patient outreach, the majority of
patients did not want to talk about their refusal. Of all patients, 13.5 percent eventually completed a test or took a medication they originally declined.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Enabling Electronic Prescribing and Enhanced Management of Controlled Medications

**Principal Investigator:** Carrow, Grant, Ph.D.
**Organization:** Massachusetts Department of Public Health
**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)
**Grant Number:** R18 HS 017157
**Project Period:** September 2007 – September 2011, Including No-Cost Extension
**AHRQ Funding Amount:** $1,199,794
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Expansion of electronic prescribing (e-prescribing) to cover federally-controlled substances (e.g., narcotics, stimulants, sedatives) is expected to increase access to needed medications and reduce risks of prescription fraud. The goal of this project is to foster the safe and productive adoption of e-prescribing of federally-controlled substances. The project examines the adoption and diffusion of e-prescribing by ambulatory care clinicians at the point-of-care. The aims of the project are being achieved through the design, implementation, and evaluation of a safe, secure, and efficient system for electronic transmission of controlled substance prescriptions. As a result, these efforts are helping to inform the U.S. Drug Enforcement Administration (DEA) as it implements the recently-promulgated Interim Final Rule (75 FR 16236) governing the electronic prescribing of controlled substances (EPCS).

The project team, led by the Massachusetts Department of Public Health (MDPH), Drug Control Program, is partnering with health information technology solutions providers DrFirst, Inc. and Emdeon to design, implement, and field-test a system for e-prescribing controlled substances in a contained ambulatory care environment. Concurrently, the project is developing and testing a data interface between the e-prescribing system and the Massachusetts Prescription Monitoring Program (MA PMP) to monitor nonmedical use and abuse of federally-controlled medications while supporting enhanced patient-clinician communication, medication access, and safety of patients with chronic medical conditions.

**Specific Aims:**
- Develop, implement, and verify a system of safe and secure electronic transmission of prescriptions for federally-controlled substances in an ambulatory care setting. *(Achieved)*
- Develop and test the interfacing of this e-prescribing system with the Massachusetts PMP to monitor prescription fraud and nonmedical use of controlled medications. *(Ongoing)*
- Conduct systems process and outcomes evaluations of the improvements to patient care, risk reduction, patient and clinician benefits, patient safety, and information privacy and confidentiality that are expected as a result of this system. *(Ongoing)*
- Develop and implement a plan for dissemination of findings. *(Ongoing)*

**2010 Activities:** Throughout the year the project team activated and expanded EPCS access to the initial pilot group of 33 providers, completed the recruitment and activation of the remaining participating
providers, and resolved systems errors as they arose. The evaluation team also continued its analysis of baseline provider survey data and conducted a post-implementation survey of the Group I prescribers to assess their perspectives on the EPCS technology after being exposed to it for 6 months. At the end of 2010, there were 157 participating prescribers, of which 142 were in possession of cryptokeys, which are the key pieces of information that control the transmission of EPCSs. In 2010, prescribing providers with cryptokeys created and transmitted 3,246 EPCSs to the nine participating pharmacies.

The project leadership reviewed all implementation issues including one that resulted in a temporary deactivation of the system on July 26, 2010 after it was discovered that, under certain circumstances, an EPCS could be transmitted to a pharmacy without the presence of a cryptokey. After analysis, the cause of the issue was identified and technical modifications were made. The system was reactivated in early October 2010.

On March 31, 2010, the DEA published its Interim Final Rule (IFR) on Electronic Prescribing of Controlled Substances in the Federal Register. The Final Rule went into effect on June 1, 2010, resulting in the allocation of significant project resources to analyze the changes and assess its impact on the project. As the project team gained a better understanding of the IFR and the requirements of each section, efforts to come into compliance were initiated on several fronts. The team has been in discussions with the DEA on compliance with the IFR for prescribing and pharmacy applications and the framework for revisions to the memorandum of agreement with the MDPH Drug Control Program. Since the promulgation of the IFR, the project partners, in conjunction with the DEA, conducted a gap analysis of the DEA requirements to determine the extent of the prescribing and pharmacy application compliance. This analysis provided the foundation for waivers to be included in new memoranda of agreement between the DEA and MDPH for prescribing and pharmacy applications. Project leadership and DrFirst explored the options for securing an identity-proofing process and establishing a relationship with certification authorities for the participating providers. The project team also reached out to the American Institute of Certified Public Accountants (AICPA) and the Information Systems Audit and Control Association, referenced in the IFR, to determine the readiness of their membership to conduct third-party audits for prescribing and pharmacy applications, as required in the IFR. As a result of these discussions, the Trust Services Task Force of the AICPA has begun developing audit guidelines for the accounting industry, which will initially be conducting the required third party audits.

To help inform the industry about EPCS and the DEA’s IFR, the project team collaborated with Emdeon on the development and airing of a town hall Webinar in September 2010. The Webinar was aired twice and was attended by more than 300 providers, pharmacists, vendor representatives, and State regulators. Because of the successful attendance, planning has begun for several additional Webinars focusing on industry segment-specific issues. The project team also conducted an orientation on the requirements of the IFR for the Berkshire County pharmacy managers who are participating in the project.

During 2010, the project also collaborated with DrFirst to create an interface file of Schedules II through V prescriptions to be securely accessed by the MA PMP on a periodic basis. The availability of this data, along with dispensed prescription information currently received by MA PMP from the pharmacies, will allow the reconciliation of prescribed to dispensed federally controlled medications. In order for this to occur, however, the MA PMP recognized there needed to be a key field, preferably a sequencing number, in each database. To achieve this, the MA PMP staff worked closely with the American Society for Automation in Pharmacy in the development of its PMP Standard version 4.1 to ensure a specific field for
this purpose was included when the Standard was released at the beginning of January 2011. As a result of these efforts, the MA PMP will be using a new field to validate the process of reconciling prescribed and dispensed controlled substances prescriptions created within the scope of the project.

Additional presentations included the project team’s first public demonstration of EPCS at the Agency for Healthcare Research and Quality Grantee and Contractor Health IT Conference in June. The evaluation team also presented project-related posters at the Academy Health Annual Research Meeting in June and the American Public Health Association Annual Meeting in November.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project team is mostly on track for meeting all its aims and milestones and the project budget is moderately underspent. Throughout the project year, the activities remained slightly behind schedule due to circumstances beyond the control of the project team, such as the significant delay in receiving a waiver from the DEA at the beginning of the project, followed by a 6-month period during which the project could not proceed with plans to activate EPCS until certain issues were resolved between the DEA and the Department of Health and Human Services. The project did not fully regain lost time and requested a no-cost extension, which was approved through September 29, 2011.

**Preliminary Impact and Findings:** In terms of system participation among the active providers, operational satisfaction appears to be high. However, anecdotal reports suggest that some providers may not be using the EPCS system for several reasons, including the lack of a participating pharmacy in the immediate service area, patients’ pharmacy preferences, low controlled-substances prescribing patterns in some participating specialties, and slow provider adoption of EPCS technology. A followup provider survey is planned for 2011 to evaluate these issues.

Based on the project team’s gap analysis of the IFR, consensus among the participants is that compliance with the IFR requirements will be achieved gradually by the end of the project. Compliance with certain IFR sections may be achieved sooner if pharmacies can operationalize polices and procedures. The DEA and MDPH acknowledged, however, that because of technological and industry standard processing limitations, it may not be possible to come into compliance with all sections of the IFR before the conclusion of the project in September 2011. More specifically, completion of third party certification audits of prescribing and pharmacy applications, the revisions of the National Council for Prescription Drug Programs transmission standards, and the ability of pharmacy applications to use, read, and store digital signatures may not be finalized until the last quarter of 2011.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use
Impact of Office-Based E-Prescribing on Prescribing Processes and Outcomes

**Principal Investigator:** Fischer, Michael, M.D.  
**Organization:** Brigham and Women’s Hospital  
**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)  
**Grant Number:** R18 HS 017151  
**Project Period:** September 2007 – August 2011, Including No-Cost Extension  
**AHRQ Funding Amount:** $1,199,007  
**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** Suboptimal prescribing practices in current systems of care delivery in outpatient settings can result in errors and excessive costs. Electronic prescribing (e-prescribing) is a technology that allows prescribers to write prescriptions electronically. The Medicare Modernization Act set goals for the adoption of e-prescribing across the country, and private coalitions have stepped forward to encourage the adoption of e-prescribing through the use of financial incentives. Effective e-prescribing systems must have utility for prescribers and must be integrated into the workflow of routine medical practice; for e-prescribing to improve quality and safety, it must have valid and usable decision support capabilities and be available at the point of care.

The primary aim of this study is to evaluate the implementation of an e-prescribing system in ambulatory settings. ZixCorp’s PocketScript system is currently used in a large number of practices in Massachusetts, New Jersey, Pennsylvania, New York, North Carolina, California, and Louisiana, providing a large study population with diverse practice types (e.g., pediatric, adult primary care, family practice, and specialty offices), locations (urban, suburban, and rural), and sizes (from single-physician practices to groups of more than 20 providers). This study will evaluate the full spectrum of e-prescribing. The project has an active partnership with the developers of the office-based e-prescribing system, and with multiple insurance companies and public programs that will provide claims data.

The project is being conducted in three phases. The first phase uses data from the e-prescribing system to evaluate physician responses to decision support interventions and alerts. In the second phase, the project brings together experts on information technology and experienced survey researchers to develop a qualitative study demonstrating the impact of e-prescribing on prescribing processes and outpatient workflow, including a large-scale survey to develop a detailed understanding of how e-prescribing can be integrated into medical practice. The third phase of the project will draw on decades of experience by the project team studying large medical databases to evaluate prescribing decisions and clinical outcomes when e-prescribing is initiated. The project will link patients’ e-prescriptions with pharmacy claims and will generate a comprehensive dataset to evaluate the true clinical impact of e-prescribing.
**Specific Aims:**

- Measure physician use of two safety-related e-prescribing functions: safety alerts and dispensed drug history. *(Ongoing)*
- Measure the effect of e-prescribing on processes of prescribing for physicians to assess characteristics of successful and productive adoption. *(Ongoing)*
- Extend and expand ongoing research to assess whether the adoption of e-prescribing is associated with improved clinical outcomes for patients. *(Ongoing)*

**2010 Activities:** Data use agreements were executed between the e-prescribing company and the research institution. The dataset was received, uploaded, cleaned, and verified. The study team has begun to define the variables and cohorts for the analyses, and project programmers have begun integrating the datasets. The key challenge in preparing the datasets has been linking events and individuals from the e-prescription files to the insurance claims files. Linkage of providers went smoothly for one health plan’s data (Tufts) and has been more challenging for another (Blue Cross Blue Shield of Massachusetts) due to a need to reconcile identifiers of providers who practice in a variety of locations. The final step will be linking e-prescriptions to filled claims.

Four focus groups were conducted during this period, two each with doctors and nurses and office managers, which explored a variety of topics that were used in developing the large sample survey. The resulting manuscript was published in the *Journal of the American Medical Informatics Association*. The large sample survey was closed to enrollment in fall of 2009. Over 1,000 survey responses were included in the final sample. During this period the data were prepared for analysis and initial analyses have focused on the comparison of stand-alone e-prescribing to integrated systems. The resulting manuscript was accepted by *Health Affairs* and published in December 2010.

**Grantee’s Most Recent Self-Reported Quarterly Status (As of December 2010):** The project progress is mostly on track with the team reporting that they are meeting 80 to 99 percent of their milestones. Project spending is roughly on target.

**Preliminary Impact and Findings:** Focus group participants identified a range of issues associated with the current use of e-prescribing in their practices, including benefits derived and perceived, challenges in using the technology, and workflow issues caused by the technology. Positive responses toward e-prescribing focused on efficiency, a reduction in medical errors, patient satisfaction, and ease of use. Negative responses focused on technological problems, medical errors, trust of technology, the learning curve for using the software, and surveillance and liability issues. There were different reactions and changes to the e-prescribing workflow based on which functions were completed by physicians versus office staff. Physicians entered prescriptions while seeing patients or immediately thereafter, whereas the office staff usually handled refills. By splitting the tasks, significant workflow efficiency was gained.

In regard to e-prescription adoption, the focus groups found that the attitude of the doctors played a major role in the perceived usefulness of the technology. Some practices that adopted the technology have found that it has been completely integrated into their daily workflow and used frequently. On the other hand, several users do not yet have complete knowledge of the functionality of the application (e.g., what the colors on the screen represent).

Survey results showed that physicians have generally positive attitudes regarding e-prescribing and the
impact of e-prescribing on the efficiency and safety of prescribing. Physicians using e-prescribing systems that are integrated into comprehensive electronic health records use more e-prescribing functionalities on a more regular basis than physicians who use stand-alone e-prescribing systems. However, the cost of stand-alone e-prescribing systems is considerably lower, which is attractive for many physicians and practices.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination
Project Summaries

Improving Otitis Media Care with Electronic Health Record-Based Clinical Decision Support and Feedback

Principal Investigator: Forrest, Christopher, M.D.
Organization: Children’s Hospital of Philadelphia
Mechanism: RFA: HS07-006: Ambulatory and Safety Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)
Grant Number: R18 HS 017042
Project Period: September 2007 – February 2011, Including No-Cost Extension
AHRQ Funding Amount: $877,011
Summary Status as of: December 2010

Target Population: Otitis Media, Pediatric

Summary: Several problems in the treatment of otitis media (OM) in children arise from physicians’ lack of awareness of national guidelines on judicious use of antibiotics and the overuse of antibiotics in OM treatment. This issue can be addressed through health information technology (IT). The goal of this project is to develop, test, and disseminate a health IT intervention that improves the quality of OM care while reducing the amount of resources used in its treatment.

The intervention uses the Children’s Hospital of Philadelphia’s (CHOP’s) electronic health record (EHR) to integrate care over time and to supply physicians with the knowledge they need at the point of care. The full intervention consists of: 1) a method for linking all services a patient receives from any physician into clinically logical clusters called episodes-of-care, 2) clinical decision support (CDS) for medications and referrals to specialists based on the best available scientific evidence, 3) feedback on past performance of OM care provided by physicians, and 4) physician training on use of tools. The study randomly assigned 24 primary care practices into groups for usual care (control), usual care without feedback, full intervention without feedback, and full intervention with feedback.

The project is being conducted in the CHOP Pediatric Research Consortium, which includes all primary care practices in the CHOP network. It utilizes the Epic ambulatory electronic record system, EpicCare 2007, a Certification Commission for Health Information Technology-certified ambulatory EHR that affords immediate, secure electronic access to clinical information, and communication at the point of care. Because OM is a common condition in children, the widespread adoption of the intervention from this project has the potential to affect the lives of millions of children.

Specific Aims:

• Develop and pilot test the OM health IT intervention. (Achieved)
• Examine overall effect of health IT intervention and the independent contribution of physician feedback on quality of care (the primary outcome). (Ongoing)
• Assess the effects of the intervention on the secondary outcomes of resource use and clinician adoption of the technology. (Ongoing)
• Upon project completion, the study team will work with members of their advisory board, including
the American Board of Pediatrics, National Committee for Quality Assurance, and the Child Health Corporation of America to disseminate the work to child health professionals nationally. *(Upcoming)*

**2010 Activities:** Following a pilot conducted in 2009, the research team implemented an 18-month intervention from March 2009 through August 2010 to examine the use and impact of CDS on the quality of care of OM. The central component of the CDS tool is the “episode grouper,” which summarizes prior care and presents a coherent overview, including recommendations for therapy and links to educational resources. Throughout the project, the research team refined and improved the grouper, adding the functionality to follow the grouper’s “thinking” in more detail as it constructs episodes. This allows the team to determine why a certain encounter was included in a particular episode. For example, the grouper’s “thinking” might include such things as “defined OM based on ICD-9 code” or “noted OM-related condition based on visit reason text.”

Throughout the intervention several quality measures were tracked as measures of the impact of CDS. The performance on these measures was compared across the intervention and control groups. The project team provided six rounds of feedback reports on four OM quality indicators directly to physicians in the feedback arm through in-person site visits. The measures include: 1) appropriate use of amoxicillin as a first-line antibiotic, 2) appropriate use of high-dose amoxicillin when amoxicillin was prescribed, 3) appropriate pain assessment, and 4) appropriate use of analgesics. Feedback reports to physicians serve a dual purpose of performance feedback and encouraging physician use of the CDS tool. This included learning how the CDS did or did not fit in with existing workflow.

The original approach was to give feedback through a report in the EHR; however, the project team found that setting aside a time explicitly to review the report and discussing it with the study physicians was helpful. The feedback report includes quality adherence information such as the proportion of patients with acute otitis media (AOM) who were prescribed narrow spectrum antibiotics when indicated. The report also includes the performance of providers with the highest (top 10 percent) adherence to guidelines, to demonstrate an achievable benchmark to providers with lower guideline adherence. The first quality indicator selected was the measurement of appropriate prescription of amoxicillin as first line antibiotic for AOM. Feedback was analyzed at the physician, practice, and network levels and given to both intervention and control sites.

In 2011, the research team will complete analysis of the data and develop several papers on different components of the research and results.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is meeting 80 to 99 percent of the project milestones on time, and is approximately five to 20 percent under budget. The underspending is due to the fact that they are behind schedule in the implementation of the intervention which is a result of building a more robust CDS system.

**Preliminary Impact and Findings:** Preliminary research for the study described physician use of the EHR during pediatric clinical encounters and the physician interactions with the patient. This research was published in the article “Electronic Medical Record Use in Pediatric Primary Care” in the Journal of the American Medical Informatics Association. Through observation, the team measured that communication with the family was simultaneous to 70 percent of the EHR use during the visit. This research contributed to understanding physician workflow as a relevant consideration in the development of CDS for pediatricians.
Measuring the impact of the CDS on quality of care is the primary outcome of the project. The project team began to analyze data on the differences in the quality of care between the control sites and sites with the CDS tool before and after the intervention. The quality data presented at the end of the intervention will be for five AOM metrics, four OM with effusion metrics, and two metrics for OM as a whole.

At a qualitative level, many lessons have been learned on how to give feedback to providers. Physicians expect scientific evidence, so data returned in feedback must be solid and defensible if it is to create behavior change. High data quality is imperative, and the team has been working to improve data in the feedback reports. Usage of the CDS tool was low (approximately 20 percent), which is being addressed through the incorporation of feedback solicited from care providers.

Initial analysis of data to demonstrate the impact of the CDS on quality is positive. Analysis of preliminary pre-intervention quality data found that pre-intervention amoxicillin was appropriately prescribed 73 percent of the time at the network level. Preliminary intervention site analysis indicates that use of the CDS increases the frequency of appropriate prescribing by five percent.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
The Bettering Lives Utilizing Electronic Systems Project: Improving Diabetes Outcomes in Mississippi with Health Information Technology

**Principal Investigator:** Fox, Karen, Ph.D.  
**Organization:** Delta Health Alliance, Inc.  
**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)  
**Grant Number:** R18 HS 017233  
**Project Period:** September 2007 – September 2011, Including No Cost Extension  
**AHRQ Funding Amount:** $1,163,573  
**Summary Status as of:** December 2010  

**Target Population:** Adults, Chronic Care*, Diabetes  

**Summary:** The prevalence and incidence of diabetes in the U.S. are reaching epidemic proportions, especially in Mississippi. The Delta Health Alliance (DHA), which has sponsored the Delta Diabetes Project (DDP) over the past several years, initiated the Bettering Lives Utilizing Electronic Systems (BLUES) Project in September 2007 to determine whether utilization of health information technology (IT) in diabetes management would enhance delivery of health care and improve health outcomes of patients. The project examines the cost-effectiveness of using well-designed, comprehensive health IT in diabetes management practices at several ambulatory clinics in Mississippi. Additionally, the study looks at the impact of the health IT on clinical outcomes, medication management, and timeliness of care.

The BLUES project uses the Allscripts Electronic Health Record (EHR), a system that is certified by the Certification Commission for Health Information Technology. The research and measurement module of the EHR enables users to easily query patient records to review key clinical performance indicators. Data is centralized from different databases to combine information related to patient demographics, clinical outcomes, reported laboratory values, and medication history. An important capability of the EHR for this project is the system’s ability to integrate and maximize the effectiveness of third-party technologies that aid diabetic care.

Four diabetes management clinics that employ the same model of diabetes care are participating in this study: two in an urban setting and two in a rural setting. One of the sites in each setting utilizes the health IT system, while the other does not. The timeline for this project coincides with independent plans to implement EHRs at these sites, which provides an invaluable opportunity to compare similar practices of health care providers and the health outcomes of their patients with and without use of a comprehensive health IT system.

Various data analysis methods are being used to measure the progress toward attaining the project aims. For example, clinician use of the various components of the EHR are being modeled as a continuous measure (percent or proportion) rather than a strict yes or no binary measure, and a mixed model analysis of covariance will be used to analyze the measure, controlling for fixed (clinic, time) and random (patient)
effects. Individual generalized estimating equations are being used to model changes over time in the proportion of patients that access various components of the Patients Interactive Module. Lastly, a multivariate model is being used to investigate and measure changes from baseline to end-of-study.

**Specific Aims:**

- Implement an EHR system in two existing diabetes management clinics, focusing on integration of the EHR into clinician workflows. *(Achieved)*
- Evaluate the impact of the EHR system on clinical processes of care and patient outcomes. *(Ongoing)*
- Produce and distribute a generalizable, replicable model of care for implementing an integrated health IT system for diabetes management care throughout the United States. *(Ongoing)*

**2010 Activities:** The DHA continued its legal, administrative, and technical work implementing an EHR system that is integrated into clinicians’ workflow at clinics in Jackson and Greenville, Mississippi. The research team met regularly via conference call throughout the year to review chart-pull progress, preliminary results, and protocols. This ongoing communication helped identify potential protocol and/or quality issues, including the discovery that some research assistants were pulling overlapping charts at the comparison sites. This discovery prompted a more strenuous review of the data, which identified the exact number of charts each clinic needed to provide in each time period to maintain the integrity of the study. Those charts were collected by year’s end and the data were entered into the database. Subsequently, the database was reviewed by the co-investigator and the data were cleaned again.

The team began to prioritize variables to be reviewed based on the research questions that are being considered. Analysis has begun but results have not yet been compiled. Preliminary reports are being run from EHR sites and are being used to test the EHR reporting process.

Some extenuating circumstances impacted the project timeline, requiring that a no-cost extension be utilized. The Jackson Medical Mall Internal Medicine Clinic changed ownership in August 2010. Management of the clinic now falls under Jackson-Hinds Comprehensive Healthcare, rather than the University of Mississippi Medical Center. This change in ownership limited access to the charts for a short period of time, but chart abstractions resumed shortly after. As mentioned above, all chart abstractions, including abstractions to replace duplicate charts, were completed by December 31, 2010. Notification of the change in ownership also required an institutional review board amendment be made, and a related amendment to request a HIPAA waiver to review medical records without patient authorization.

Numerous presentations on the BLUES project were made throughout the year, including; 1) a poster presentation at the Agency for Healthcare Research and Quality Heath IT Grantee and Contractor Conference in June 2010; 2) a presentation of preliminary data at the American Health Information Management Association Symposium in July 2010; and 3) a presentation of updated data at DHA’s EHR-Telemedicine Summit in November 2010.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project was granted a 12-month no-cost extension due to delays in data collection described above. Progress is on track to achieve all the aims and milestones set forth in the project. Below-budget spending at year’s end provided the resources to maintain the project staff allocations during the extension period.

**Preliminary Impact and Findings:** Due to the delays in data collection with the comparison sites, analysis has begun but findings are not available at this time. Preliminary reports from the EHR sites are being used to test the EHR reporting process.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Implementation and Use

*AHRQ Priority Population*
eHealth Records to Improve Dental Care for Patients With Chronic Illnesses

**Principal Investigator:** Fricton, James, D.D.S., M.S.

**Organization:** HealthPartners Research Foundation

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017270

**Project Period:** September 2007 – September 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $996,737

**Summary Status as of:** December 2010

**Target Population:** Chronic Care*, Chronic Obstructive Pulmonary Disease, Congestive Heart Failure, Diabetes, Xerostomia

**Summary:** This project is a group-randomized clinical trial with dentists on the use of simple reminders in an integrated electronic health record. The primary goal is to evaluate the effectiveness of an integrated electronic health record system that includes an electronic medical record (EMR), electronic dental record (EDR), and a personal health record (PHR) at improving the quality and safety of dental care for patients with chronic illnesses. The EMR used in this project is EPIC Hyperspace Spring 2007, developed by Epic Systems Corporation and certified by the Commission for Health Information Technology (CCHIT). The EDR, developed by General Systems Design Group, Inc., is not CCHIT certified, as a certification process for EDRs does not exist. The tethered PHR is EPIC MyChart® and is used in combination with HealthPartners’ Web-based patient portal.

The study compares two interventions against a usual care control. The interventions are designed to address how and to whom special dental care needs are communicated. The interventions are: 1) a reminder to the patient delivered primarily via a PHR e-mail or, if e-mail is not available, over the phone by the dental clinic staff and/or postal mail (Group A); or 2) a point-of-care reminder to the dentist through the EDR (Group B). The patients in the sample population have special dental care needs as a result of four chronic conditions: diabetes mellitus, congestive heart failure, chronic obstructive pulmonary disease, and xerostomia (dry mouth) caused by medications or related conditions.

An EDR integrated with an EMR and PHR provides a unique opportunity to improve the dental care of patients with chronic conditions by alerting patients to their special care requirements and alerting dentists at the point of care. Furthermore, the integration of an EMR, PHR, and EDR into an integrated electronic health record system improves health information exchange, communication, and cost effectiveness of care, particularly for patients with chronic illnesses. This project demonstrates how leveraging an integrated electronic health record system can improve patient outcomes, increase awareness, and improve clinical decisionmaking by identifying problems that need remediation and providing immediate evidence-based recommendations.

**Specific Aims:**

- Determine the effectiveness of integrated EMR-based interventions toward changing dentist and patient behavior. *(Achieved)*
• Determine the impact of an integrated EMR-based intervention upon the use of emergency and/or restorative dental care. (Achieved)

• Produce and distribute a generalizable, replicable model of evidence-based care recommendations for implementing an integrated health information technology system for diabetes and other chronic illness management within dental care practices throughout the United States. (Ongoing)

2010 Activities: The primary focus of activity was on recruitment, data collection, and data analysis. In addition, a set of recommendations was developed on necessary action steps for dentists to meet the needs of patients. The outcome data on whether or not the guidelines were accessed was extracted and the impact of the intervention was analyzed. Outcomes were evaluated during the three phases of the study: a static period; the first 1 to 6 months of the activation period; and months 7 to 12 months of the activation period.

The primary study outcomes are:
1. Total Use: The overall frequency with which providers accessed the Web-based clinical guidelines.
2. Targeted Use: The proportion of instances in which access to the Web-based clinical guidelines was done for targeted patients (i.e., those identified as having one of the four conditions of interest).
3. Ongoing Use: The proportion of providers who accessed the Web-based clinical guidelines for all patients.

Preliminary findings were presented at several national meetings including the Agency for Healthcare Research and Quality Annual Health IT Grantee and Contractor Meeting in June. The findings are also being summarized for publication submission.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project has entered a no-cost extension period during which the findings will be reported and submitted for publication.

Preliminary Impact and Findings: The 18-month study period of the clinical decision support (CDS) alerts and personalized recommendations included 10,890 out of a total of 59,147 patients with one of the four chronic conditions, vastly surpassing an expected sample size of 2,600. The rate at which the providers accessed the clinical guidelines in response to the CDS alert was evaluated for 101 dental providers. The total use of care guidelines was found to have increased among both providers and patients. There was also a generalizable effect of increased use of guidelines by dentists for all patients (p<0.05). The alert aimed at providers was shown to be more effective than a reminder that was targeted to the patient at increasing the rate at which guidelines were accessed. However, the rate at which the guidelines were accessed decreased after 6 months of the alert system being implemented (p<0.05).

This project demonstrated that utilization of clinical guidelines for medically compromised patients can be improved with clinical decision support using e-dental records with provider and patient activation strategies. The clinical implication is that, as our population ages, dentists must be vigilant in adapting care for medically compromised patients to maintain safety and quality.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of

Business Goal: Implementation and Use

* AHRQ Priority Population
Pharmaceutical Safety Tracking: Managing Medications for Patient Safety

**Principal Investigator:** Gardner, William, Ph.D.

**Organization:** Children’s Research Institute

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017258

**Project Period:** September 2007 – May 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,156,142

**Summary Status as of:** December 2010

**Target Population:** Medicaid, Mental Health/Depression, Pediatric

**Summary:** Pharmaceutical Safety Tracking (PhaST) is a health information system that assists clinicians’ management of medications in ambulatory settings. It is an automated system for monitoring medication adherence, side effects, and patient symptoms using research-based assessment procedures administered via interactive voice response (IVR) telephony. PhaST seeks to protect outpatients taking medications that have recognized side-effect risks even when those drugs are correctly prescribed.

When a patient reports a problem with a medication on an IVR call, PhaST alerts a psychiatric social worker trained to triage the problem, counsel the patient or family, and when necessary, contact the patient’s prescribing clinician or the hospital emergency services. The goal of PhaST is not to replace clinician visits with telephone calls, but to improve safety and remediate access problems by augmenting communication channels already available to families. PhaST communicates data about patients to clinicians using e-mail. PhaST does not directly store information in an electronic health record (EHR) system. Rather, copies of the e-mailed PhaST reports are filed in paper charts. This is primarily due to the fact that the complete EHR system has not yet been fully implemented for the behavioral health clinics, which are the primary source of patient referrals, and because PhaST serves patients across systems with independent health record systems.

The target medications for this project are pediatric antidepressants. To compare the use of PhaST to usual care, the project is conducting a randomized trial in a large, urban, specialty mental health system that serves a primarily Medicaid population. The project seeks to enroll youths who are receiving new prescriptions for antidepressants to assess them for adverse events at baseline and 1-, 2-, and 3-month milestones. Patients are recruited based on physician referral. A total of 200 to 250 patient recruits are anticipated by the project end. The project will compare chart-documented adverse events to adverse events that have been determined by an examiner who is blind to the patients’ randomization. It is predicted that there will be higher agreement between chart-documented adverse events and examiner-determined adverse events when PhaST is used. The project is also comparing PhaST to usual care on measures of patient and provider satisfaction, patient outcomes, and measures of the quality of medication management, such as rates of patient medication non-adherence.
**Specific Aims:**

- Determine whether PhaST is superior to usual care on measures of system process. *(Ongoing)*
- Determine whether PhaST is superior to usual care on measures of patient and provider outcomes. *(Ongoing)*

**2010 Activities:** The primary focus of activity was on finalizing and deploying the production version of the PhaST software. The ongoing recruitment of study participants was another important focus. The final deployment of the highly-automated system was a gradual process which began in June 2010, and as confidence in the system grew, less supervision was required. While the revised system requires significantly less supervision than it did initially, minimal supervision continues to be required due to the inherent security environment that a Web-based program faces when interacting outside the hospital system. The remainder of the project will be spent completing patient followup, data analysis, and summarizing the results.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is mostly on track in meeting all its aims and milestones. Moderate underspending in the budget will help facilitate the no-cost extension period, during which time the data analysis and manuscript writing will occur.

**Preliminary Impact and Findings:** There are no findings to report at this time. Initial recruitment was slower than originally planned, but participant retention is relatively high. Although the overall sample size may be smaller than anticipated and some questions may be harder to answer, this is not anticipated to significantly impact the analysis. Anecdotally, despite lower-than-expected physician adoption of the software, physicians who use the software provide very positive feedback. The system has also been very reliable, with virtually no downtime.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

* *AHRQ Priority Population*
RxSafe: Shared Medication Management and Decision Support for Rural Clinicians

**Principal Investigator:** Gorman, Paul, M.D.

**Organization:** Oregon Health & Science University

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017102

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,200,000

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care

**Summary:** It is widely recognized that health information technology (IT) can improve medical care and patient safety, but questions remain about how best to put health IT systems into practice. This project seeks to provide important information about how to integrate decision support into clinical practices to improve the quality and safety of medication management for people with chronic illnesses. This project investigates the feasibility and impact of novel approaches to clinical decision support in multidisciplinary ambulatory care, emphasizing high-risk transitions of care. The project has developed technology to support shared medication management for persons with chronic conditions. This health IT will be used to facilitate clinician decisionmaking, and improve outcomes for patients and providers in the management of chronic conditions. Ultimately, the project aims to show improvements in medication management by 1) providing the means to effectively share medication information, 2) making any corrections or improvements made by one team member to the regimen visible to all team members, and 3) providing clinicians using the system with access to evidence-based information at the time and place it is needed.

This project is a continuation of a successful collaboration between community-based nurses and physicians providing ambulatory services in an Oregon coastal community, a multidisciplinary team of university-based investigators with expertise in medicine, nursing, medical informatics, and computer science, and the Oregon Rural Practice-based Research Network, which provides the infrastructure, coordination, and support. Clinical settings for the project are independent clinic practices in two coastal communities, local home health services, and transitions in care into and out of the single community hospital and its emergency room. The patient focus is on community-dwelling persons with chronic conditions on multiple medications. The choice of these specific innovations was informed by experience with development and early deployment of RxSafe, a system that consolidates medication lists of patients in long-term care to integrate information for providers involved in prescribing, dispensing, administering, or monitoring medications.

**Specific Aims:**

- Enhance clinician cognitive performance in medication management tasks by exploiting the
underlying semantics of medication lists to improve the organization and presentation of medication list information. (Ongoing)

- Implement medication list management tools that are integrated into clinician-specific and task-specific workflows to support medication reconciliation at high-risk transitions as well as in ongoing ambulatory care. (Ongoing)
- Increase the effectiveness of medication management activities of clinicians in multiple roles by improving their coordination and communication using shared medication management tools. (Ongoing)
- Employ evolving standards and architectures to link external, machine-actionable, evidence-based clinical information in context-appropriate and user-appropriate ways to support shared medication management by clinicians practicing in ambulatory settings. (Ongoing)

2010 Activities: Field observations of clinical medication management tasks remained on track to produce descriptions of cognitive resources and task models during this period (Aims 1, 2). The team evaluated medication management open source software solutions including MyRxPad, MyMedicationList, and OpenMRS platform (Aim 3). The team configured these clients to interact through the versioning system (SyncRx) and explored the usefulness of this technology in prototype testing, to determine the requirements and challenges to its development and deployment (Aim 3).

Pharmacy students were recruited to develop test sets of medication data for evaluating performance of other classification schemas (USP DI, WHO-ATC, and AHFS). Refinement of the documentation for the parser function was completed. The prototype for the identifier module underwent trial-and-error testing. The classifier completed its demonstration phase and began classifying medications automatically using National Drug File Reference Terminology (NDFRT) classes (Aim 4).

The team completed the “pipeline” prototype, demonstrating the Web-based clinical decision support model that would allow composition of independent medication information related services. The demonstration included services for parsing, identification (using RxNorm), and classification (using NDFRT) of medication information, and a software harness to allow composition of these and other medication management services.

A “SyncRx” prototype for collaborative medication management was being developed, based on the Markle Foundation Common Framework for health information exchange, using open source approaches including OpenMRS-based clients as well as client software based on the National Library of Medicine MyRxPad and MyMedicationList software.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Project progress is mostly on track, meeting most milestones on time. The project budget was significantly underspent. Funds will be used to underwrite expenses during the no-cost extension. The project is focusing on analysis of field data and disseminating findings from field observation as well as software tools. The team anticipates this will be a major activity moving forward.

Preliminary Impact and Findings: The project team found that nurses, pharmacists, and physicians used different categorization schemes when thinking about medications. Physicians form sophisticated initial mental models of the patient when performing a simple medication reconciliation task, and these models reinforce cognitive performance. Pharmacists and nurses performing medication management
tasks identify and correct discrepancies in the medication regimens of their patients in a more complex fashion than what is commonly defined and performed as “medication reconciliation”. This work is embedded in other tasks relating to the total care of the patient. Finally, no publicly-available standard for classifying medications is in use, and this is a major barrier to effective multidisciplinary distributed decision support.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Improving Post-Hospital Medication Management of Older Adults With Health Information Technology

**Principal Investigator:** Gurwitz, Jerry, M.D.  
**Organization:** University of Massachusetts Medical School - Worcester  
**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)  
**Grant Number:** R18 HS 017203  
**Project Period:** September 2007– August 2011, Including No-Cost Extension  
**AHRQ Funding Amount:** $1,199,952  
**Summary Status as of:** December 2010

**Target Population:** Elderly

**Summary:** The project focuses on developing and evaluating the value of an enhanced health information technology (IT)-based medication reconciliation system interfaced with an ambulatory electronic medical record (EMR). It utilizes the EpicCare Ambulatory EMR, which is certified by the Certification Commission for Health Information Technology. The project employs a randomized, controlled trial design to test the health IT-based transitional care intervention with enhanced medication reconciliation and therapeutic monitoring alerts to improve the quality and safety of patient monitoring and medication management. It also focuses specifically on the transition from inpatient to ambulatory settings for older adults who have multiple comorbid conditions and are prescribed high-risk medications. This research allows for the examination of an integrated health IT intervention on the quality of followup, outpatient clinician workflow, occurrence of adverse drug events (ADEs), and health care utilization, to gain insight into the effective use of clinical alerts and coordinated delivery of actionable information to outpatient clinicians in the management of ambulatory elderly patients subsequent to hospital discharge.

The project’s health IT intervention begins with medication reconciliation at the time of hospital discharge. Complex information management and coordination of data sharing across multiple settings often hamper clinician workflow in the post-hospitalization setting. The intervention addresses these special challenges. Specifically, the intervention automates key steps in the transition of care from the hospital to home, including: 1) expediting and facilitating discharge followup appointment scheduling, including monitoring for no-shows; 2) generating medication lists that alert the primary care provider to key therapeutic additions; and 3) generating patient-specific therapeutic monitoring recommendations for high-risk medications in the post-hospitalization period.

**Specific Aims:**

- Evaluate the impact of automated scheduling alerts on the rate of followup to an outpatient provider within 14 days of hospital discharge. *(Ongoing)*
- Evaluate the impact of automated monitoring alerts on the prevalence of appropriate monitoring for selected high-risk medications at 30 days from the time of hospital discharge. *(Ongoing)*
- Evaluate the impact of a health IT-based transitional care intervention on the incidence of ADEs within 45 days of hospital discharge. *(Ongoing)*
• Evaluate the impact of a health IT-based transitional care intervention on the rate of hospital readmissions and emergency department visits within 30 days of discharge. *(Ongoing)*

• Assess (by level of comorbidity, number of medications, and use of specific high-risk medications) whether a health IT-based transitional care intervention is more effective in subgroups of patients. *(Upcoming)*

• Determine costs directly related to the development and installation of the health IT-based transitional care intervention. *(Ongoing)*

**2010 Activities:** The project staff completed the development of the therapeutic monitoring guidelines and standards which were reviewed and approved by the research pharmacists, Fallon Clinic (part of the UMass Memorial Medical Group) pharmacy leadership, and medical staff leadership. The Fallon Clinic IT team has used the guidelines to program the intervention.

Preprogramming for the EMR was completed by the Fallon Clinic IT team, and the intervention was launched. Monitoring alerts underwent beta testing for validity, accuracy, and specificity, and the research and programming teams reviewed and refined alerts to minimize alert fatigue in the actual intervention. The programming team developed tracking reports for the research team and the pharmacist abstractors to allow them to follow details of the clinical trial including enrollment and randomization. The project staff began to screen and enroll eligible patients and perform randomization.

Training of the research pharmacists was completed between June and August 2010. Abstraction procedures and the navigation of the EMR were reviewed. The clinical research pharmacists began EMR chart review for ADEs. In addition, the project team is examining outcomes of hospital discharges during the baseline period, defined as the one year prior to the initiation of the intervention. The project team is also reviewing the data collected from project members regarding the time invested relevant to launching the intervention for return on investment analyses.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is progressing on track, is meeting all milestones, and is on time with all tasks. Project spending is roughly on target. The project is entering its one-year no-cost extension and is focused upon continuing implementation of the intervention, and collecting and analyzing data.

**Preliminary Impact and Findings:** In July 2010, *The American Journal of Managed Care* published the study manuscript detailing the therapeutic monitoring guidelines.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
### Project Summaries

#### Safety Through Enhanced e-PreScribing Tools (STEPStools): Developing Web Services for Safe Pediatric Dosing

**Principal Investigator:** Johnson, Kevin, M.D., M.S.  
**Organization:** Vanderbilt University  
**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)  
**Grant Number:** R18 HS 017216  
**Project Period:** September 2007 – February 2011, Including No-Cost Extension  
**AHRQ Funding Amount:** $1,157,753  
**Summary Status as of:** December 2010

**Target Population:** Pediatric

**Summary:** The Safety Through Enhanced e-PreScribing Tools (STEPStools) project assesses a generally-available knowledgebase for pediatric medication management’s impact on quality and safety. STEPStools is constructing, pilot testing, and evaluating available tools that provide medication-specific knowledge about dose rounding and extemporaneous formulations necessary for small children. The project also evaluates the effectiveness of using a service-oriented architecture to distribute knowledge, which is an emerging method for knowledge management and dissemination.

The project is committed to releasing this database as a toolkit, initially as a dataset available publicly through the Agency for Healthcare Research and Quality, and ultimately through the National Library of Medicine and RxNorm, the drug nomenclature for standardizing the representation of clinical drugs. The project will inform the vendor community and general public about the utility of Web services as a tool for knowledge dissemination, as proposed in places such as the clinical decision support roadmap. In addition, the American Academy of Pediatrics (AAP) will contribute to this knowledgebase and will enable its availability to e-prescribing developers for many years.

**Specific Aims:**

- Convene a panel of AAP and American Medical Informatics Association experts to construct a knowledgebase of actionable data to guide e-prescribing systems in the appropriate rounding of calculated doses and selection of extemporaneous medication formulations. **(Achieved)**
- Develop Web services and Web browser client to allow browsing this knowledgebase. **(Achieved)**
- Evaluate the usability and content validity of these Web services through a series of pediatric prescribing use-cases, site visits to pilot users, and an examination of the error rate of prescriptions generated with and without the use of these Web services. **(Ongoing)**

**2010 Activities:** The validation of the rounding knowledgebase, which provides age-specific dosages for commonly-prescribed medications, continued through 2010. Dr. Johnson and his team created rounding recommendations and presented these recommendations to the AAP. Rounding consensus was reached on approximately 20 medications, after which the rounding knowledgebase was completed.

In order to test the knowledge and rounding algorithm, the team added another testing phase of the knowledge database. The evaluation was not part of the initial proposal but became necessary as...
the research team realized the challenges associated with selecting a formulation and ideal dose for each patient request. The knowledge and rounding algorithm was tested with a dataset of thousands of completed prescriptions, and the variability between the rounding algorithm recommendation and the approach used by the pediatrician was quantified. Analysis of these differences provided additional information to improve the algorithm. A survey of pediatric providers was completed and providers were presented with a series of case studies to show the results of medication rounding through STEPStools. The providers were asked to agree or disagree with the suggested dose, and to explain why if they disagreed. Each instance of disagreement was reviewed by the project expert panel and resolved.

The ecological survey conducted early in the project informed the process of incorporating STEPStools into the e-prescribing workflow. Throughout the year the research team worked with vendors to tailor the database and integrate its contents into the e-prescribing workflow. Two groups, Office Practicum and Vanderbilt, are contributing to the evaluation of STEPStools. NextGen was originally planned as a partner, but they were not able to collaborate on the required timeline. STEPStools is now live with the Office Practicum and Vanderbilt sites and both vendors are working with multiple practices. Due to delays in collaborations with vendors, the grant received a no-cost extension to continue the evaluation through February 2011.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is on track with 80-to-99 percent of milestones and the budget spending is roughly on target.

**Preliminary Impact and Findings:** The project team is working on several manuscripts that describe the project findings. These include a manuscript on the rounding knowledgebase and another on the rounding algorithm. A third paper will describe the team’s approach to developing Web services. In addition, several posters are planned.

Some of the initial findings are about the types of information that providers find useful in the tool. For example, the tool scores a variety of answers, starting from the top-choice medication, down to one that would not be recommended. The team learned what information providers find useful, and what is extraneous.

The project team also increased its understanding of how to link knowledgebases when working with vendors. RxNorm is used as a link between the rounding knowledgebase and the vendor-supplied knowledgebase. The RxNorm creates unique identifiers for the medication name (i.e., Amoxicillin), the routed form of the medication (Amoxocillin Oral), and the dispensable form of medication (Amoxicillin 400 mg/5mL Oral Suspension). Although the unique identifiers were expected to link with other knowledgebases, a number of unanticipated barriers have arisen and will be outlined in a planned manuscript. Another finding was that inactive ingredients in compounds are not typically included in RxNorm and are not coded in many vendor systems. Therefore, inactive ingredients will not be included in the knowledgebase.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

* AHRQ Priority Population
Electronic Prescribing and Electronic Transmission of Discharge Medication Lists

**Principal Investigator:** Kaushal, Rainu, M.D.

**Organization:** Joan and Sanford I. Weill Medical College of Cornell University

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017029

**Project Period:** September 2007 – March 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,187,674

**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** This project consists of three studies assessing the impact of health information technology (IT) on patient safety in the ambulatory setting. The first is a multi-center before-and-after study measuring the impact on medication errors of switching from one electronic prescribing (e-prescribing) system to another, in this case from a home-grown to a vendor-based system. The second is a qualitative study of physicians using one-on-one-interviews and direct observation to understand variations in human-computer interactions with this new e-prescribing system and how user patterns or system features may influence medication errors. The third is a randomized, controlled trial evaluating the effect of electronically transmitting discharge medication lists from the hospital to the ambulatory setting using: 1) medication discrepancies at the first ambulatory visit following discharge; and 2) adverse drug events (ADEs) 30 days post-discharge as outcome measures.

These studies are important because they have the potential to substantially add to the knowledge of ambulatory medication safety as it relates to the value of vendor-based electronic prescribing systems for medication management in the ambulatory setting, and the impact of health information exchanges on patient safety at a critical time of transition. In addition, by including a qualitative component on human-computer interactions, this project has the potential to yield critical insights to why certain health IT interventions do or do not work, and how future interventions should be designed to better align themselves with physicians’ workflow. The studies also have implications for the many institutions and practices that are transitioning from one electronic health record (EHR) to another. If rates of errors vary greatly between commercial systems there are potential policy implications for more stringent certification criteria of e-prescribing to ensure medication safety.

**Specific Aims:**

- Measure the effects on medication errors of transitioning from one e-prescribing system to another in the ambulatory setting. *(Ongoing)*

- Measure the effects on human-computer interactions of transitioning from one e-prescribing system to another in the ambulatory setting. *(Ongoing)*

- Evaluate the impact on medication discrepancies of electronic transmission of medication lists at discharge from the hospital to the ambulatory setting at the first ambulatory visit following discharge. *(Ongoing)*
• Evaluate the impact on ADEs 30 days post-discharge of electronic transmission of medication lists at discharge from the hospital to the ambulatory setting. (Ongoing)

2010 Activities: The first study, measuring the effects on medication errors and data collection of transitioning from one electronic prescribing system to another, is nearly complete. Data have been collected for all four time periods (baseline, 3 months, 1 year, and 2 years post-implementation). Data cleaning and analysis are complete for the first three periods and in progress for the fourth. One manuscript has been submitted for publication and a second has been started.

The second study, a qualitative study measuring the effects on human-computer interaction of this same transition, is also near completion. The team completed two sets of interviews, the first with 15 providers and the second with 13 providers. Data from the first set of interviews have been analyzed and a manuscript has been submitted. Data from the second round of interviews are being assessed and a manuscript will be developed.

The third study evaluates the impact on medication discrepancies and ADEs of electronic transmission of medication lists at discharge. The chief medical information officer and the medical director of information services for Weill Cornell Physician Organization (the investigators) developed an application to electronically transmit discharge information, including medication lists from the inpatient setting to the outpatient setting. This tool has been implemented at New York-Presbyterian Hospital. Dr. Kaushal’s team, in collaboration with Dr. Jeffrey Schnipper from Brigham and Women’s Hospital and Harvard Medical School, also developed data collection tools to identify and characterize medication discrepancies, including a patient background form that obtains demographic and health status information from patients in the hospital, and a patient medication survey that collects medication data and ADEs at approximately 30 days post-discharge. The team further developed a medication error and adverse drug event tool. An experienced research nurse will use the tool to identify medication errors in the data and ADEs experienced by the patient. All medication errors will be reviewed by two experienced physicians who will use this tool to rate the severity of the medication errors and ADEs. The data collection period has been extended to attain a large enough sample size to reach the statistical power necessary for analysis. Data cleaning is concurrent with data collection. Analysis and manuscript preparation will follow.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is making good progress and spending is roughly on target. Data collection is complete for the first two studies and in progress nearing completion for the third study. Data cleaning and analysis is in progress for all three studies.

Preliminary Impact and Findings: For the quantitative study, the rates and types of prescribing errors made by physicians were assessed at three time periods: baseline (when physicians were using the locally developed EHR with minimal clinical decision support for e-prescribing); 3 months post-implementation of a commercial EHR with more advanced clinical decision support for e-prescribing; and 1 year post-implementation. The research team found that error rates were highest at baseline and lowest at 1 year. Improvements were primarily attributed to reducing inappropriate abbreviation errors. Other error types increased and remained elevated at 1 year post-implementation suggesting that transitioning from a locally developed EHR to a commercial EHR for e-prescribing can reduce certain errors; however, important safety threats remain. Overall, despite intensive efforts to ease the transition, most providers found transitioning extremely difficult. The commercial system was not
perceived as improving medication safety, despite the more advanced clinical decision support. Additionally, physicians felt the commercial system was too complex and therefore reduced efficiency. This has important implications for the design and implementation of commercial systems with advanced clinical decision support for e-prescribing.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Implementation and Use
Evaluation of a Computerized Clinical Decision Support System and Electronic Health Record-Linked Registry to Improve Management of Hypertension in Community-Based Health Centers

Principal Investigator: Kopal, Helene, M.P.A., M.P.H.
Organization: Primary Care Development Corporation
Mechanism: RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)
Grant Number: R18 HS 017167
Project Period: September 2007 – September 2011, Including No-Cost Extension
AHRQ Funding Amount: $1,132,569
Summary Status as of: December 2010

Target Population: Hypertension, Low SES/Low Income*, Racial or Ethnic Minorities*: Latino

Summary: Hypertension affects millions of adults in the United States, many of whom are among the underserved populations that bear a disproportionate burden of chronic disease and illnesses. Community Health Centers (CHCs) are a major source of care for the underserved. The goal of this project is to analyze the efficacy of office-based electronic decision support and provider feedback in improving hypertension control in CHCs.

Partners Primary Care Development Corporation (PCDC), Open Door Family Health Center (Open Door) (a not-for-profit organization that operates four primary care sites serving low-income, primarily Latino immigrants), New York University College of Dentistry and School of Medicine, and the Columbia University Mailman School of Public Health are analyzing the effects of a multi-component, technology-driven quality improvement intervention on hypertension control. This collaborative effort provides a unique opportunity to target an underserved, hard-to-reach immigrant population. This project addresses the need for empirical outcome data on effective information technology strategies for improving control of hypertension among low-income immigrant populations.

The hypothesis of the study is that clinical decision support (CDS) and electronic registry-linked performance feedback will be more effective at improving hypertension control than a standard-care electronic health record (EHR) in CHCs that serve low-income, primarily Latino patients. On a monthly basis, the project extracts data from the eClinicalWorks EHR, which is certified by the Certification Commission for Health Information Technology, and estimates the effect of the intervention using AutoRegressive Integrated Moving Average modeling. The large number of minority and low-income patients served by Open Door CHCs, as well as the existing practice-based research infrastructure provided by PCDC and Open Door, offers a unique opportunity to investigate the efficacy of these interventions.

Specific Aims:

• Test whether an office-based EHR with decision support and registry-linked provider performance feedback is more effective in improving hypertension control than a standard EHR alone. (Ongoing)
• Assess the implementation process, and delineate factors that influence adoption of the EHR-supported quality improvement intervention. (Ongoing)

2010 Activities: Following the implementation of the CDS in 2009, the EHR data were successfully transmitted and verified in 2010. Post-intervention surveys were conducted among providers to measure attitudes on the CDS tools and use of guidelines. Analysis of the post-intervention process measurement is underway. In the meantime, a paper summarizing the baseline data and findings on the correlates of hypertension and hypertension control among minority and immigrant populations in CHCs is being finalized for journal submission. In addition, the development of a how-to manual for implementing CDS quality initiatives in CHCs is also in progress.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is mostly on track in meeting all its aims and milestones. Moderate underspending in the budget will help facilitate the no-cost extension period, during which the post-intervention analysis will be completed and findings will be summarized.

Preliminary Impact and Findings: Preliminary findings indicate that blood pressure control among hypertensives improved as a result of the intervention. The baseline EHR data and relevant findings that focus on correlates of blood pressure control are currently being summarized for publication. Although the paper has not yet been finalized, the data tabulations have been completed.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Implementation and Use

* AHRQ Priority Population
Optimizing Medication History Value in Clinical Encounters With Elderly Patients

Principal Investigator: Lapane, Kate, Ph.D.
Organization: Virginia Commonwealth University
Mechanism: RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)
Grant Number: R18 HS 017150
Project Period: September 2007 – September 2011
AHRQ Funding Amount: $1,199,989
Summary Status as of: December 2010

Target Population: Elderly*

Summary: Electronic prescribing (e-prescribing) combined with a medication history may help physicians better understand adherence issues with older patients. These systems promote clinician-patient partnerships, empower patients to participate in treatment decisions, and help clinicians to negotiate acceptable medication regimens that are more amenable to patient follow-through. Some e-prescribing systems are integrated with pharmacy chains, making medication histories and information on unfilled prescriptions available to clinicians.

Stemming from Dr. Lapane’s previous research, this project explores the hypothesis that in order to optimize improvements in quality of medication management during clinician office visits, clinicians need additional training to improve their use of the medication history in the clinical encounter. The research team also hypothesizes that additional clinical information systems must be used in conjunction with the flow of detailed medication history via e-prescribing to help guide and structure the clinician’s approach to medication management in ambulatory settings.

The project aims to test information technology (IT) by leveraging the flow of community pharmacy-based medication history at the point of prescribing, coupled with training to enhance patient-provider communication. The project is focused on improving medication management among elderly people seeking care in ambulatory care settings. Specifically, the intervention strives to aid in the evaluation and prioritization of medication management issues at the point of prescribing, incorporating medication information into the clinical encounter, and fostering the clinician-geriatric and patient-caregiver communication regarding potential medication management issues. The purpose of the intervention is to improve the facilitation of informed, shared decisionmaking and monitoring for medication-related problems, and assist clinicians in evaluating and monitoring complex medication regimens to help identify, resolve, and prevent medication-related problems.

In order to test this intervention, the project will conduct a large-scale randomized trial, recruiting physicians that use DrFirst, an e-prescribing application and network to transmit prescriptions to pharmacies. One-half of the practices will receive the innovative modality for delivery of the standard of care by leveraging medication history information to generate triggers or alerts; the other half will receive the triggers plus training. The evaluation of the project relies on extensive process tracking, existing data sources of medication history, and primary data collection of provider information.
**Specific Aims:**

- Develop geriatric-specific algorithms to identify potential issues with medication management (e.g., polypharmacy, potentially inappropriate medication use, duplicative therapy, and nonadherence) using community pharmacy-generated medication history. *(Achieved)*

- Develop structured, problem-oriented frameworks for organizing medication history information during visits (triggering) for common issues identified by the algorithms developed in Aim 1. *(Achieved)*

- Develop and pretest modules to teach clinicians how to improve geriatric patient-provider communication relating to medication management with the use of technology (training). *(Achieved)*

- Test the impact of these interventions on clinician behavior using a randomized controlled trial with two arms: 1) delivery of triggers; and 2) delivery of triggering and training interventions. *(Ongoing)*

- Develop “tool-kit” resources and developed intervention products for use by nonphysician providers in other ambulatory settings (e.g., pharmacists in community pharmacy settings). *(Achieved)*

**2010 Activities:** While physician practice recruitment has started, it has remained a significant challenge. The intervention has been administered to those randomized to the treatment arm.

The research team worked with the e-prescribing software developer, DrFirst, to finalize the specific triggers and to review additional issues as needed. This process was informed by the analysis of secondary data to confirm what had been learned from earlier systematic reviews. The triggers have been implemented, and all physicians participating in the study have had the triggers installed in their e-prescribing solution.

In order to code the physician-patient interaction, physicians are audio taping a small number of clinical encounters at baseline and followup. The research team worked closely with the developers of the Medicode System to develop and test a protocol for coding patient-physician communication. All baseline audio tapes were submitted for coding.

The team identified a few areas for improvement for the physician training modules, and updated the Web site and CD modules to include the changes. They also used Articulate software to convert the training modules into a more effective format. Each CD contains one module, and the plan is for each physician to receive one module every 10 days for four waves.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project budget is underspent primarily because a substantial portion of the budget is tied to participant recruitment, as well as coding of clinical encounters. Spending will be on target following enrollment phase. Project progress is on track in some respects but not in others due to challenges in recruitment.

**Preliminary Impact and Findings:** To date, physicians are more likely to use the CDs than the Web-based modules. The CDs have also been tested in training other health professions about drug issues experienced by older adults, and the team has confirmed that the content is appropriate for this wider audience.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.
Business Goal: Implementation and Use

* AHRQ Priority Population
Improving Quality through Decision Support for Evidence-Based Pharmacotherapy

**Principal Investigator:** Lobach, David, M.D., Ph.D., M.S.

**Organization:** Duke University

**Mechanism:**
RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017072

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,198,429

**Summary Status as of:** December 2010

**Target Population:** Chronic Care*, Medicaid

**Summary:** This project developed a decision support system for medication management with the goal to promote increased adherence to evidence-based pharmacotherapeutic guidelines both through traditional clinic-based models of care and through new care models including population health management and cross-disciplinary teams. The system is based on an emerging standard for decision support and uses routinely available claims and scheduling data in order to serve as a replicable model for broader use of decision support for medication management. The decision support system used in this project, known as the System for Evidence-Based Advice through Simultaneous Transaction with an Intelligent Agent across a Network (SEBASTIAN), is the basis for an international Health Level 7 standard for clinical decision support using a service-oriented architecture. Increased availability and use of decision support tools for medication management can be expected to reduce medication errors, improve health care quality at an acceptable cost, and augment disease management for patients and populations.

This project builds upon a regional health information exchange (HIE) network known as Community-Oriented Approach to Coordinated Healthcare (COACH), that was created to connect providers serving 43,000 Medicaid beneficiaries across traditional institutional boundaries from both rural and urban settings in a six-county region in the Northern Piedmont of North Carolina. This network includes 28 private primary care clinics, three federally qualified health centers, four rural health clinics, three urgent care facilities, 11 government agencies, five hospitals, and two cross-disciplinary care management teams. Rules for evidence-based pharmacotherapy for priority areas identified by the Institute of Medicine (IOM) have been encoded in a standards-based decision support tool that has been in use within the HIE network for 4 years to promote population health management. These rules are designed to function using routinely available claims and scheduling data in order to make the proposed approach more generalized, portable, and scalable. The primary study hypothesis is that adherence to evidence-based pharmacotherapy will be highest among patients who receive medication management information sent both to their clinic-based practitioners and to their care managers. The expected effect on safety and quality from this project will be improved adherence to evidence-based pharmacotherapy guidelines. This project involves a three-arm randomized controlled clinical trial (RCT) within COACH to evaluate the impact of the medication management interventions. To enhance the data in the HIE, new data
importation programs were developed for practices using different health information technology vendor-based practice management applications for patient scheduling and encounter billing activities.

**Specific Aims:**

- Expand the functionality of an existing decision support system in use within a regional HIE network for Medicaid beneficiaries to incorporate evidence-based (EB) pharmacotherapy and to promote medication adherence. *(Achieved)*
- Implement and evaluate the impact of two complementary interventions for medication management on adherence to EB pharmacotherapy among Medicaid beneficiaries in ambulatory care settings through a three-arm RCT. *(Ongoing)*
- Compare resource utilization and assess the economic attractiveness of the interventions to promote medication adherence and EB pharmacotherapy. *(Upcoming)*
- Disseminate information regarding the development and impact of the interventions through Web teleconferences, professional meetings, educational lectures, and peer-reviewed journals. *(Ongoing)*

**2010 Activities:** The three-armed medication management RCT was fully initiated in December 2009 at the 13 participating practices, and closed in December 2010. All components of the enhanced decision support system functioned reliably through the year. On the business day prior to a scheduled appointment for one of the study patients, SEBASTIAN is used to generate medication management reports that include a list of known IOM conditions, a graphical summary of the filled prescriptions for the last year arranged by therapeutic class, a numeric calculation of adherence for each medication and class over one year, and EB pharmacotherapeutic suggestions for classes of medications that are missing based on known patient conditions. The medication management point-of-care reports are consistently generated and delivered to the clinics on the day prior to scheduled appointments so clinic staff can deliver the reports to providers when patients are being seen in the clinics. Case managers also receive email alerts for patients who have potential medication adherence issues related to a chronic disease, no visits to their primary care clinic in the past 6 months, and no scheduled appointments at their primary care clinic.

Data collection and site monitoring visits were main focuses of team activities during 2010. In January 2010, the team finalized standard operating procedures for conducting the visits. The purpose of the visits was threefold: to verify report handling procedures; to verify receipt of the medication management reports by providers at the point-of-care; and to obtain feedback about provider satisfaction and report utilization. The visits were held at months 1, 3, 6, 9, and 12 of the trial. Initial visits were conducted during a 4-week period in January and February with a convenience sample of 11 practices and 22 primary care providers who received the reports. At several clinics the report handling procedures, which clinic staff proposed prior to implementation, were not being accurately followed and corrective measures were taken. Accordingly, providers in several clinics reported inconsistent receipt of the reports prior to scheduled patient appointments and issues leading to these inconsistencies were identified and addressed. In each of the 11 clinics some providers needed additional education on the medication management reports and instruction on how to use the report for clinical decision support. In addition to the monitoring visit methods described above, the 6-month visit also included a contextual evaluation survey of the intervention at the four clinic sites with the highest point-of-care report volume for practice managers and providers.

Additional feedback on provider utilization of the report and the EB suggestions is obtained when providers return the optional data update feedback form. Provider comments have generally been favorable and
indicate the reports are being used for clinical decision support and to prompt pharmacotherapy discussions with patients. By the end of November, approximately 90 percent of the data update feedback forms had been entered into the Access study database for data analysis.


Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The team has been approved for a no-cost extension through August 2011. Progress is now completely on track, according to the revised project plan and timeline, and the budget is somewhat underspent, approximately 5 to 20 percent.

Preliminary Impact and Findings: Full evaluation data will not be available until the RCT is complete; however, informal feedback from providers on the usefulness of the medication management report has been favorable and suggestions have been made to keep the system operational after the grant ends and to use the system on other populations and in other venues.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Implementation and Use

* AHRQ Priority Population
Using Health Information Technology to Improve Ambulatory Chronic Disease Care

**Principal Investigator:** Mehr, David, M.D., M.S.

**Organization:** University of Missouri–Columbia

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017035

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,192,603

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Elderly*

**Summary:** Coordinating fragmented chronic disease care requires new systems to manage information between providers and enhance communication with patients. To improve patient care quality and safety, the Family Medicine and General Internal Medicine practices at the University of Missouri–Columbia (MU) are conducting a phased implementation of selected ambulatory care health information technology (IT) systems and functions. This project proposes a formative (in-process evaluation aimed at improvement) and summative (final overall) evaluation of health IT innovations designed to improve chronic disease care in the ambulatory primary care practices at MU. These innovations are the result of collaboration between MU clinicians from the Department of Family and Community Medicine and the Cerner Corporation, MU’s Certification Commission for Health Information Technology-certified medical record vendor.

Specific strategies in this health IT project include providing physicians with comparative performance reports in one of three formats, and providing patients with access to a Web-based, interactive software system that features secure messaging, in-home reconciliation of all medications, and use of in-home “smart” diagnostic devices to send patient data directly to the care team.

The project proposes a multi-method evaluation of health IT innovations designed to enhance the quality of primary care for chronic diseases, including qualitative interviews, surveys, and analysis of outcome data. The innovations are being implemented differently in various practices and with different associated care systems. This variation in care processes provides an extraordinary opportunity to evaluate factors that influence health IT innovations’ effects on performance-based quality improvement, care coordination, and patient self-management.

**Specific Aims:**

- Evaluate the change in patient care processes and outcomes following introduction of health IT-generated clinician quality performance reports across differences in practices and peers. (Ongoing)
- Evaluate the effectiveness and changes associated with an interactive Web-based patient interface software system (IQ Health), including in-home medication reconciliation. (Ongoing)
- Evaluate the use of in-home “smart” diagnostic devices (e.g., blood pressure cuffs, glucometers) connecting patients with their care teams. (Ongoing)
Disseminate information regarding the development and impact of the interventions through Web teleconferences, professional meetings, educational lectures, and peer-reviewed journals. (Ongoing)

2010 Activities: Preliminary analysis of the impact of access to reports on performance indicators, such as systolic blood pressure <140/90, was conducted in 2010 and is discussed in the findings section. In addition to measuring the impact on the performance indicators, the team interviewed and observed physicians to assess reactions to performance reports and the context within which physicians use them.

The development of summary screens is also part of the Cerner-MU collaboration. The summary screens allow the clinician to view multiple elements of a patient record, such as laboratory values and medications for a diabetic patient, on a single screen. They also provide quality indicator data on that specific patient. A survey was distributed to clinicians to evaluate the usability of the summary screens and the results were written into a manuscript that was submitted for publication in 2010.

The evaluation of the Web-based patient interface was completed through a survey of patients and providers who used IQ Health and the next generation health IT system, Healthe. The Web portal includes: secure messaging (including prescription requests), medical record review (including medication list), and appointment scheduling. This qualitative information will inform development of improved patient interface software. Two manuscripts have been prepared; one focusing on patients, the other on providers. In addition, this evaluation includes assessment of the medication verification feature of the Web-based systems. Pharmacists visited participating patients and coached them on reviewing their medication list. Patients were asked to review their medication list and generate a message to their provider through Healthe (preferably) or regular e-mail to notify them of any changes or additions. This message did not include an all-inclusive list of patient medications, only the changes patients felt the provider needed in order to update the patients’ medical record. The team then evaluated the information the patient sent, the nature of problems identified (e.g., incorrect listing of medications in the electronic medical record), and the response of providers to these messages.

To understand the uptake and use of Healthe, the project evaluated patterns of enrollment or non-enrollment and use of the Web portal. A manuscript that addresses patient expectations, perceptions, and use of the Web portal is under development.

The evaluation of the use of in-home “smart” diagnostic devices (home blood pressure and blood glucose monitors) continued throughout 2010 and will be completed early in 2011. There were delays due to incompatibility between patients’ diagnostic equipment and computers during software releases, and the shift to upgrade telephone lines to digital cable. Patients were given a survey at enrollment and intervention patients received an additional survey at the conclusion of their participation in the study (3 months). Data collection continued for actively-participating patients through December 2010. Qualitative interviews with nurses and physicians regarding their perceptions of the smart devices began at the end of August and are expected to be completed early in 2011.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is mostly on track and the project budget is somewhat underspent due to a delay in some project activities.

Preliminary Impact and Findings: The project team presented results on the use of the single-summary screens for summarizing diabetes care at the September 2009 Agency for Healthcare Research and Quality annual meeting. The evaluation of the summary screens determined that providers were able to
retrieve information more quickly, with fewer mouse clicks, and improved accuracy. Qualitatively, the providers embraced the new tool and agreed that rapid access to information is critical. If identifying data is too time consuming, providers may give up, ask the patient to recall information, and if necessary, repeat exams. Initial data on the summary screen indicate that this tool accelerates information retrieval.

In 2010, the project team began to analyze the data to measure the change in patient care processes and outcomes following introduction of health IT-generated performance and comparison reports on quality of care. Preliminary analysis suggests that overall performance is improving in most clinics on most measures. During the initial phase (through February 2010), when only some clinics received pull reports, it appeared that, over time, having access to pull reports was associated with improvement. However, there are differences between clinics that overlap differences in the kind of report that was received; analysis of this data continues.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use

* AHRQ Priority Population
**Veterans Administration Integrated Medication Manager**

**Principal Investigator:** Nebeker, Jonathan, M.D.

**Organization:** Western Institute for Biomedical Research

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017186

**Project Period:** September 2007 – March 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $594,582

**Summary Status as of:** December 2010

**Target Population:** Adults, Veterans

**Summary:** Computerized clinical decision support (CDS) research is often focused on improving technology, but more research is needed on how the use of CDS in the context of the process of clinical care can improve patient outcomes. The Veterans Administration (VA) has implemented CDS to assist clinicians in reaching quality goals. However, in 2006, 25 percent of hypertensive patients did not reach the performance standards. To better support providers in reaching quality goals for more hypertensive patients, this project funds the development and evaluation of a new health information technology application called the Integrated Medication Manager (IMM). The IMM facilitates clinicians’ decisionmaking by helping them consider relevant data when planning patient care. In a departure from the traditional medical record, a major feature of this system is the explicit linking of patient problems, therapies, and goals. This project will compare IMM to a standard electronic health record (EHR), thereby generating new knowledge about medication management.

Design guidelines for the IMM were determined by analyzing providers’ cognitive processing of information and how and what information is shared among a clinical team. In the first phase of the project, physicians, mid-level providers, and pharmacists were followed during clinical visits. Between patients, they were asked to “think aloud” and describe their thought processes as they worked through decisionmaking for a patient using the EHR. The findings of the observations were shared with the development team to guide them as they refined the IMM software.

The second phase of the project evaluates the IMM software using test cases in simulation studies. The simulation studies provide insight into how providers integrate information and further support evaluation of the IMM.

**Specific Aims:**

- Identify cognitive components of providers’ therapeutic decisionmaking in the field. **(Achieved)**
- Refine and evaluate the IMM using simulation studies. **(Ongoing)**

**2010 Activities:** The software design was completed for the IMM and the focus of the work was the development of test cases for the simulation studies. The research team completed creating, pilot testing, and revising all test cases. The team’s approach to creating test cases changed based on lessons learned in building the first case. The team initially thought creating test cases would be more difficult than using real patient cases but found that the reverse is true. Real patient cases are, in fact, too complex to be used for the tests.
Materials to support the simulation experiment, including followup interview questions, were also finalized. Pilot testing for the simulation experiment concluded in fall 2010. Pilot testing served three purposes: 1) testing the simulation design and materials; 2) evaluating the quality and accuracy of the test cases; and 3) refining interfaces and logic of the IMM software.

The pilot compared the new IMM software to the standard VA software. The goal is for the new software to allow faster decisionmaking by providing higher-quality data to the provider, especially when the patient’s problems are complex. Throughout the test cases, the complexity, time horizon, and saliency of the available information differ. The focus disease is more evident or less evident, important information is located further back in time in the patient’s medical history or is more recent, and patients’ problems are highly complex or less complex. And finally, in certain test cases, the provider is interrupted while the complexity of the case is manipulated to see if the provider can quickly recover and return to what they were doing. In all cases, the hypothesis is that faster and higher-quality decisionmaking will occur when providers use the new software instead of the standard EHR.

The first study participant completed the simulation experiment in December 2010, and experimentation has continued with other participants. The participants include VA and non-VA physicians and mid-level providers. Ten test cases are presented to each participant and the participants are randomly assigned to the new software or to the standard control software. The evaluation will measure the speed and quality of software use.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is mostly on track. The team is meeting about 80 to 99 percent of their milestones and is generally on time. Project spending is roughly on target.

Preliminary Impact and Findings: The project team has completed the cognitive components analysis and is eager to share the results of this analysis and its implications on human factors analysis.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Implementation and Use
Medication Safety in Primary Care Practice—Translating Research into Practice

**Principal Investigator:** Ornstein, Steven, M.D.

**Organization:** Medical University of South Carolina

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017037

**Project Period:** September 2007 – September 2010

**AHRQ Funding Amount:** $1,183,549

**Summary Status as of:** September 2010, Completion of Grant

**Target Population:** General

**Summary:** The Practice Partner Research Network (PPRNet) is a practice-based research network among primary health care providers in 42 States who use a common electronic medical record (EMR). PPRNet, has developed the Practice Partner Research Network - Translating Research into Practice (PPRNet-TRIP), a quality improvement model that translates research into primary care practice. The Medication Safety - Translating Research into Practice (MS-TRIP) study is a demonstration project being conducted among 20 PPRNet practices. The project developed a set of medication safety measures relevant for primary care, which were incorporated into the quarterly practice performance reports that were sent to participating practices.

The 2-year intervention included the development and dissemination of performance reports, network meetings, and practice site visits to help practices systematize their use of the medication safety clinical decision support features in their EMR system, McKesson Practice Partner, which is certified by the Certification Commission on Health Information Technology. The EMR features warnings for drug allergies, drug-drug, and drug-disease interactions, incorrect dosages, drug ineffectiveness, and prompts for therapeutic monitoring to prevent adverse drug events. A theoretical model for primary care practice improvement was used to foster team-based approaches to prioritizing performance, system redesign, better use of EMR tools, and patient activation. The intervention included network meetings, site visits, and performance reports. Improvement plans were qualitatively evaluated from field notes and organized to present a comprehensive approach to improving medication safety in primary care using EMRs. An assessment was made on the impact of the intervention on the incidence of preventable prescribing and monitoring errors.

**Specific Aims:**

- Develop a set of PPRNet medication safety indicators based on literature and refined to reflect cumulative expertise of members. *(Achieved)*
- Incorporate PPRNet medication safety indicators in quarterly practice reports distributed to 20 participating practices. *(Achieved)*
- Assess the impact of the PPRNet-TRIP quality improvement (QI) model on medication safety indicators in participating practices. *(Achieved)*
2010 Activities: Second site visits were conducted to the participating practices revealing that sites made minor adjustments in their improvement plans based on their experiences during the first year of the intervention. Practices refined their medication reconciliation processes with emphasis on “check-out” procedures. Check-out procedures refer to printing medication lists to encourage adherence, printing orders for medication monitoring for patients who go to outside laboratories, and providing reminders to bring medications to follow-up visits. In addition to the site visits, the project team continued to prepare and distribute quarterly medication safety reports to the participating practices.

The final network meeting was held in September 2010, in Charleston, South Carolina. The audience for this dissemination meeting was expanded to include all interested PPRNet members, not just those participating in the project. Agenda items included findings and lesson learned from the MS-TRIP project. Findings were also disseminated through various publications and presentations. A paper titled, “Medication Prescribing and Monitoring Errors in Primary Care: A Report from the Practice Partner Research Network” was published in the BMJ Quality and Safety Journal. A manuscript titled, “Improving Medication Safety in Primary Care Using Electronic Health Records” was published in the Journal of Patient Safety and describes improvement plans made by the participating practices. A poster presentation titled, “Primary Care Practice Strategies to Improve Medication Safety Using Electronic Medical Records” was held at the Academy Health Research Meeting in June 2010.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project met all aims and milestones and was completed on time.

Impact and Findings: The consensus development process was successful in selecting a broad set of primary care medication safety quality indicators. Thirty medication safety indicators were selected. Change in avoidance of errors from July 1, 2008 to July 1, 2010 was analyzed as the primary outcome. A total of 49,047 patients over the age of 18 years were eligible for at least one of the medication safety indicators across the two-year intervention. Median practice performance on three indicator categories significantly improved: avoiding potentially inappropriate therapy from 70 percent to 82.7 percent; avoiding potential drug-disease interactions from 87.2 percent to 89.4 percent; and monitoring or prevention of potential adverse events from 74.3 percent to 79.8 percent. Avoidance of potentially inappropriate dosages (88 percent to 90.5 percent) and potential drug-drug interactions (98.8 percent to 98.6 percent) did not significantly change over time.

Through dissemination of quarterly audit and feedback reports, annual practice site visits for quality improvement planning and network meetings for best practice sharing, practices selected and implemented a variety of improvement strategies. Broad efforts, such as enhanced medication reconciliation, formalized refill protocols, and implementation of standing orders for laboratory monitoring, necessitated the involvement of the entire team in local practice redesign. More specific strategies were prioritized in response to audit and feedback results and involved greater use of EMR monitoring tools, use of interaction and dosing tools at the point of care as well as patient activation and outreach activities.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Implementation and Use
A Partnership for Clinician Electronic Health Record Use and Quality of Care

**Principal Investigator:** Pohl, Joanne, Ph.D.

**Organization:** Michigan Public Health Institute

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program:
Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017179

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,184,765

**Summary Status as of:** December 2010

**Target Population:** Chronic Care*, Medically Underserved

**Summary:** Despite the emphasis on health information technology (IT) in ambulatory care, current use of electronic health records (EHRs) in ambulatory settings remains low. After a health center makes a monetary investment in an EHR, there remain significant barriers to full and effective use of the system, including redesigning workflow to incorporate use of the EHR before, during, and after a patient visit. It is especially important for clinical decision support (CDS) systems that these barriers be overcome. If information is not available at the point of care and decisionmaking, health IT cannot impact quality and outcomes of care. Therefore, it is important to identify and disseminate strategies to overcome barriers to full EHR use, and strengthen the link between technology adoption and improved quality of patient care.

The Institute for Nursing Centers and the Alliance of Chicago Community Health Services’ (Alliance) project studies the effectiveness of a partnership that shares resources and utilizes a data-driven approach to promote full clinician use of an EHR. Three nurse-managed health centers and three community health centers are participating to improve the quality of care in areas of preventive care, chronic disease management, and medication management for vulnerable populations. These partners have a record of highly productive research, successful EHR implementation, commitment to data-supported high quality health care for vulnerable populations, and a history of building and maintaining strong collaborations.

The goals of this project address one of the key problems in leveraging health IT to support high-quality patient care: despite the potential, CDS is often not used effectively or consistently by clinicians. The design of this project incorporates qualitative investigations and quantitative analyses at both the individual- and the center-level. The critical link between full use of EHR functionality, including CDS features, and clinical performance and quality outcomes will be examined with rigorous statistical methods. The product is the integrated General Electric (GE) Centricity Practice Management EHR System and is Certification Commission for Health Information Technology-certified with substantial customization of CDS in templates developed by the Alliance. The quality indicators selected are those that the Institute of Medicine has identified as priority areas for improvement and where significant disparities across racial, ethnic, and income groups exist. Qualitative methodology will add to the field’s understanding of health center leadership and change management required for successful use of EHR.
Specific Aims:

- Study the effectiveness of a partnership that shares resources and uses a data-driven approach to promote full use of an EHR by clinicians in settings that serve vulnerable populations to improve the quality of care in the areas of preventive care, chronic disease management, and medication management. (Ongoing)
- Test the links between clinician use of an EHR and quality of preventive care, chronic disease management, and medication safety. (Ongoing)
- Examine organizational processes in the implementation and full use of an EHR in relationship to care delivery and outcomes. (Ongoing)

2010 Activities: Data collection was the main focus of 2010. EHR usage data with a one-quarter and a one-year look-back period has been collected for the Alliance sites, Campus Health Center (Detroit, MI), and Glide Health Services (San Francisco, CA). Productivity data continues to be queried on a quarterly basis at the Alliance sites, Campus Health Center, Glide Health Services, and Arizona State University (ASU)’s NP Healthcare clinics, Downtown and Scottsdale. Qualitative (interview) data collection is complete for Alliance sites, Campus Health Center, Glide Health Services, and ASU’s NP Healthcare-Downtown site. ASU’s NP Healthcare-Scottsdale site had completed baseline and during-implementation interviews.

Computer literacy data collection is complete at all sites. Clinician satisfaction data collection is complete for Alliance sites, Campus Health Center, Glide Health Services, and ASU NP Healthcare-Downtown. The ASU NP Healthcare-Scottsdale site completed the during-implementation survey for its new NP in November 2010. The post survey will be collected from this NP in February 2011. Patient satisfaction surveys have been collected at ASU NP Healthcare-Downtown, Detroit Campus Health Center, NP Healthcare-Scottsdale, and Glide Health Services at both the pre- and post-implementation time points. Physician Practice Patient Safety Assessment data collection is complete for all sites. Medication Safety data have been collected from Campus Health Center and Glide Health Services during preload, and were being collected from the two ASU sites as they enter historical medications for existing patients.

Clinical performance and outcome measures have been collected at one year post-go-live for Glide Health Services, and data have been collected from the Alliance centers at roughly three years post-implementation. Data collection for one year post-go-live at Campus Health Center is in progress. A full set of quality measures will be collected at the ASU NP Healthcare sites once they have been live on the EHR for one full year. Since Campus Health Center, Glide Health Services, and the Alliance sites will have been live on the EHR for over two years before the end of the study, the team will be able to obtain performance data at a second time point for each of these sites.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Project progress is mostly on track and project spending is roughly on target. Efforts during the no-cost extension focus on data collection, analysis, and development of manuscripts to publish project results.

Preliminary Impact and Findings: The mean score for perceived effect of an EHR on clinical practice at the nurse-managed center sites (evaluated 8–13 months post-go-live) was 2.95 on a scale of 1–5, and the CHCs’ (evaluated 19–23 months post-go-live) mean score was 3.48. There could be an effect of time yielding more recognition of the beneficial effects as providers gain EHR experience and competence.
Variation in end-user satisfaction and use is highly contextual: the implementation at the center with the lowest satisfaction was hampered by problems with connectivity and lack of lab interface. Nurse-managed health center sites face additional EHR implementation challenges that may affect end-user satisfaction, including high numbers of part-time providers and financial instability. A challenge in the measurement of use of CDS is that providers have multiple ways to document and receive support (e.g., multiple forms/templates). Use of chronic disease and preventive care templates is relatively low, which requires additional investigation. Variation of CDS use around specific chronic disease forms appears to be related to the predominant type of patients in the health center.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and use

* AHRQ Priority Population
Harnessing Health Information Technology to Prevent Medication-Induced Birth Defects

**Principal Investigator:** Schwarz, Eleanor, M.D.

**Organization:** University of Pittsburgh at Pittsburgh

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017093

**Project Period:** September 2007 – September 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,199,370

**Summary Status as of:** December 2010

**Target Population:** Women

**Summary:** Each year, 150,000 infants – one to three percent of all births in the United States – are born with some form of physical or mental birth defect. The Institute of Medicine has identified prevention of birth defects as one of six national priorities. It is estimated that each year, 12 million women in the United States use medications that might increase the risk of birth defects if used during pregnancy. However, studies show that the concurrent use of contraception with such medications can prevent associated birth defects. Unfortunately, when prescribing potentially teratogenic medications, medications that may disturb the growth or development of the embryo, clinicians rarely counsel women about contraception, and approximately six percent of pregnant women are exposed to medications that may increase the risk of birth defects.

This project proposed to develop and rigorously evaluate ways that health information technology (IT) may help doctors counsel women about preventing birth defects that could be caused by the use of certain medications. Dr. Schwarz and her project team began by conducting a series of focus groups with clinicians and patients seen in academic and community-based practices in order to find out what information would be most useful to primary care clinicians and their patients.

Data from the focus group discussions were used to refine the two distinct health IT application interventions: 1) multi-faceted clinical decision support (CDS), and 2) the networked tablet computer’s electronic collection of machine-actionable information about women’s risk of pregnancy. The impact of each of these interventions is being evaluated using a factorial design randomized controlled trial. In the first trial, multi-faceted CDS (intervention) is being compared to streamlined clinical alerts (control). The second trial evaluates whether collecting machine-actionable information about women’s risk of pregnancy using a networked tablet computer (intervention) is superior to the way clinicians usually collect this information (control).

Data from the following sources were collected to inform the study: 1) data abstracted from the electronic medical record (EMR) when clinicians prescribed teratogenic medications; 2) phone interviews conducted with women prescribed medications by study clinicians; and 3) participating clinicians surveyed about their satisfaction with the CDS they received. These data are being used to confirm the hypotheses that clinicians in the intervention groups will prescribe fewer teratogenic medications, be more likely to
prescribe contraception when prescribing a teratogenic medication, have more patients report satisfaction with the counseling they received, and report more satisfaction with the CDS they received. All of the practice sites use the EpicCare EMR system.

This evaluation will provide much-needed information on how health IT can best be harnessed to prevent medication-induced birth defects nationwide. The health IT intervention shown to be most effective will be implemented throughout the University of Pittsburgh Medical Center (UPMC), which supports three million outpatient visits each year.

**Specific Aims:**

- Develop and implement two CDS systems designed to alert ambulatory clinicians to the risk of medication-induced birth defects. *(Achieved)*

- Evaluate the effect of two CDS systems designed to alert ambulatory clinicians to the risk of medication-induced birth defects. *(Ongoing)*

**2010 Activities:** In 2009, decision support was rolled out across UPMC’s outpatient clinics. In 2010, project staff abstracted real time data from the EMR to assess use of the CDS system and impact on prescription of teratogenic medications and concordant prescription of contraceptives, and collected surveys from study clinics’ clinicians and patients. The data from these sources were merged to permit assessment of the CDS across control and intervention study arms.

Data analysis and manuscript writing were the primary focuses for the research team in 2010. The team assessed the data collected from four focus groups with women of reproductive age, using a grounded theory approach to content analysis, and produced two manuscripts which were published in 2010. In preliminary analyses of the EMR data, two important issues were identified. First, the team found that the CDS system was not activated for participating resident physicians. As a result, study analyses will be adjusted and this limitation will be described in manuscripts. The project team also determined that approximately 13 percent of providers responded to the alerts generated by the CDS system by prescribing an alternate medication that was also potentially teratogenic. As the CDS system was only designed to issue one alert, the clinician was not alerted if the newly prescribed medication was also potentially teratogenic. To respond to this unintended consequence, the team is looking into modifying the system so that physicians will be alerted to any risks that may result from a newly prescribed medication. In 2011, the team will complete further analyses of the EMR data that incorporate information provided by the physician and patient surveys.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is progressing well overall despite the fact that the CDS system was never activated for some participating clinicians. Dr. Schwarz reports that the project is mostly on track and spending is roughly on target.

**Preliminary Impact and Findings:** Three types of barriers to contraception counseling were identified during the clinician focus groups: barriers at the patient, provider, and health system levels. The providers identified patient contraceptive method of preference, outside influences, already on birth control, desire for pregnancy, religion, patient discomfort, and sexual activity confidentiality as patient level barriers to counseling. The bulk of the discussion focused on perception of barriers that providers bring to contraception counseling. At the provider level, barriers included: pregnancy risk; lack of knowledge, training, or comfort; beliefs about certain contraceptive methods; a perceived patient
responsibility for initiating discussions; a need for skilled personnel for certain contraceptive methods; and a lack of communication with subspecialists. Finally, health system level challenges regarding contraceptive counseling included lack of insurance or family planning coverage, limitations on time, access to providers trained to fit or insert contraceptive devices, competing medical priorities, visit type, case mix, and lack of a clinical care system to remind providers.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

* AHRQ Priority Population
Can Risk Score Alerts Improve Office Care for Chest Pain?

**Principal Investigator:** Sequist, Thomas, M.D., M.P.H.

**Organization:** Brigham and Women’s Hospital

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017075

**Project Period:** September 2007 – August 2010

**AHRQ Funding Amount:** $687,539

**Summary Status as of:** August 2010, Completion of Grant

**Target Population:** Adults, Heart Disease

**Summary:** Assessment of chest pain in ambulatory patients is challenging; high-risk patients may go undetected, while low-risk patients may be subjected to unnecessary evaluations. This randomized, controlled study implemented and evaluated an intervention to improve the treatment of primary care patients with acute chest pain in a large, integrated health care delivery system. The study used electronic alerts to risk-stratify outpatients with chest pain and presented the information to primary care providers (PCPs) in an electronic medical record (EMR). The intervention took place at Harvard Vanguard Medical Associates (HVMA), a multispecialty integrated group practice with 140 PCPs caring for approximately 300,000 patients at 14 centers in eastern Massachusetts. Since 1999, HVMA has integrated the Epic EMR system, a Certification Commission for Health Information Technology-certified product, into all aspects of ambulatory care within the organization, including point-of-care services, such as electronic order entry and reminders, and centralized functions, such as patient scheduling.

This study has important implications for optimizing the outpatient treatment for chest pain symptoms through the innovative use of electronic decision support, while documenting the cost implications of such a strategy. This work provides a model for how ambulatory practices across the country can use EMRs to present real-time patient risk information to clinicians with the goal of improving patient safety and quality, which has important implications for both acute and chronic care.

**Specific Aims:**

- Identify predictors—including race and sex—of risk-appropriate evaluation and treatment of patients presenting to primary care offices with acute chest pain. (Achieved)
- Determine whether rates of appropriate evaluation and treatment of patients with acute chest pain can be improved through the use of point-of-care electronic risk alerts that provide individual patient cardiac risk profiles and tailored evaluation and treatment recommendations to PCPs. (Achieved)
- Perform a cost analysis for the provision of electronic decision-support for patients with acute chest pain. (Achieved)

**2010 Activities:** At the start of the study, clinicians were surveyed on their risk perceptions. The survey results were analyzed and presented in a manuscript that described clinician risk thresholds and treatment strategies for patients with chest pain. This included analysis of provider demographics, size of patient
panel, and other factors to better understand their risk tolerance and corresponding approach to treatment for patients with chest pain.

The clinical trial was conducted and completed among 276 primary care clinicians across 14 ambulatory health care centers. The trial based its enrollment on complaint rather than diagnosis. As a result, a key component for the successful delivery of the intervention was training medical assistants to accurately identify patients presenting with chest pain, and enter a coded “chief complaint” of chest pain into the electronic record. This code was used as the electronic trigger for the delivery of the decision support tool, and ongoing training for new medical assistants continued through 2010.

The core of this intervention involved the delivery of electronic decision support to clinicians as they evaluated patients who presented with the problem of chest pain. The decision support is provided in the form of an electronic alert (“pop up”) within the EMR. The project contracted with Epic Systems to build the decision support tool for this project. This involved creating specifications for calculating cardiac risk scores (Framingham Risk Score), and designing the interface with the electronic record. The “cardiac risk calculator” was incorporated into Epic’s new standard software package for use beyond the project.

The evaluation of the impact of the intervention was completed in 2010, which included a separate assessment for high- and low-risk patients. For the former, a chart review of performance on EKG and administration of aspirin; for the latter, a review of use of exercise stress testing. The first charts were available for review in January 2009 and continued throughout the year. About 7,500 charts were reviewed and analyzed, and the team prepared a manuscript of the results for publication.

The third aim of the project was to perform a cost analysis of the provision of electronic decision support for patients with chest pain. The team estimated the costs of the intervention through collaboration and meetings with the project economist. Cost estimates were developed for individual components of the intervention, including the creation of data reports, chart reviews, electronic decision support, and treatment and evaluation costs.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of August 2010):** The project ended with all aims achieved and spending on target.

**Impact and Findings:** Initial qualitative findings from the project included learning how to better describe clinical care for patients in primary care with chest pain. This requires understanding the prevalence of conditions, the resources used, common mistakes, and patient demographics. The training of medical assistants yielded great improvements in coding accuracy. They achieved a 70 percent rate of correct identification of patient complaints when chest pain was the single patient complaint, and a 50 percent rate of correct identification when the patient had multiple complaints.

The average age of clinical trial participants was 50 years (± 13). Sixty-five percent were female, with 601 (20 percent) of all patients defined as high-risk and 2,402 (80 percent) of all patients defined as low-risk. Treatment strategies were somewhat more aggressive for high-risk patients than for low-risk patients, though the differences were not large, and the majority of cardiac stress tests were negative. Findings included identification of substantial variability between clinicians in evaluation strategies, including electrocardiogram performance, cardiac stress test performance, and emergency department referral. Acute myocardial infarction was uncommon (0.6 percent), but occurred more frequently among high-risk patients than to low-risk patients. Among the 16 (0.5 percent) patients diagnosed with acute myocardial
infarction, 15 (94 percent) had an electrocardiogram performed, four (25 percent) had an outpatient cardiac stress test performed, and six (38 percent) were mistakenly sent home from the primary care office. Acute myocardial infarction is uncommon among primary care patients with acute chest pain but it is commonly missed when present. Variability in current evaluation patterns suggest that better strategies are needed. The team expects to submit one paper describing the results of the clinical trial, a second paper on provider risk tolerance to patients with chest pain, and a potential third paper on the economic analysis.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Improving Laboratory Monitoring in Community Practices: A Randomized Trial

**Principal Investigator:** Simon, Steven, M.D., M.P.H.

**Organization:** Harvard Pilgrim Health Care, Inc.

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017201

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $990,640

**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Medication errors and preventable adverse drug events (ADEs) occur commonly among patients in the ambulatory setting, and constitute an important target for patient safety and quality improvement. Laboratory monitoring to ensure the safety and effectiveness of drug therapy and the timely management of abnormal results of laboratory testing have been increasingly recognized as important areas for improving patient safety in ambulatory care. Promising interventions have been developed for practices affiliated with hospitals and integrated delivery systems, but to date efforts have not adequately reached physicians practicing solo or in small community practices.

The overall aim of the project is the assessment of clinical decision support (CDS) point-of-care alerts and a results management system to address barriers to and facilitators of laboratory monitoring. The study uses eClinicalWorks, a widely used and commercially available Certification Commission for Health Information Technology (CCHIT)-certified electronic health record (EHR); therefore, findings may be generalized to other CCHIT-certified EHRs. The project includes a qualitative analysis of the barriers and facilitators of laboratory monitoring and timely followup of abnormal results among clinicians in ambulatory primary care practices. This information will be used to develop, implement, and evaluate computerized alerts to facilitate indicated laboratory monitoring of medications at initiation or continuation of therapy. The second part of the study is the evaluation of an enhanced results management system to facilitate patient management. Initially, the grantee proposed to design and implement a results management system, however, the EHR vendor developed a similar system. As a result, the grantee will evaluate the vendor results management system at two clinics where the system was recently implemented. Baseline analyses will yield information on the rates and correlates of laboratory monitoring errors, and the management of abnormal test results in community-based primary care settings. The study incorporates a dissemination plan, which includes not only publication and presentation of the results in scientific settings but also the creation of a dissemination guide that will be made freely available to other community-based ambulatory practices implementing EHRs and point-of-care alerts.

**Specific Aims:**

- Identify barriers to and facilitators of laboratory monitoring and timely followup of abnormal results. *(Achieved)*
• Design, implement, and evaluate CDS (point-of-care alerts) for laboratory monitoring in a widely used, commercially available EHR that addresses barriers to and facilitators of laboratory monitoring. *(Ongoing)*

• Design, implement, and evaluate a results management system to efficiently handle abnormal laboratory test results in ambulatory care. *(Retired)*

• Develop a detailed dissemination guide and widely distribute it to other practices and communities interested in implementing similar interventions. *(Upcoming)*

**2010 Activities:** Dr. Simon received a no-cost extension for a fourth year of his research. Originally this project was conceived as two clustered randomized controlled trials that would be implemented consecutively—first the computerized point-of-care alerts, then the results management system. Due to delays and ultimately changing priorities of the original implementing partner, the grantee sought other collaborators. As a result, the study was changed significantly. Dr. Simon is working closely in consultation with the Agency for Healthcare Research and Quality to implement these changes.

He has established a new partnership with Take Care New York (TCNY), which is rolling out eClinical Works to primary care practices in New York City. TCNY will integrate the grantee’s computerized point-of-care alerts into eClinical Works to evaluate the use of the alerts for facilitation of laboratory monitoring of medications. Based on power calculations, the grantee aims to recruit 10 to 20 practices for a six month study. Participating clinics will be randomized to the alerts intervention arm or the control arm at a one-to-one ratio. The research group has obtained institutional review board approval and enrollment is in progress.

The results management part of the grant has also experienced changes. Initially, Dr. Simon proposed to develop and implement a results management system, however, eClinical Works simultaneously developed a plan to expand its EHR to include a patient portal, which would add much of the same functionality that the grantee proposed to develop. As a result, the grantee has shifted the focus of the study to evaluation of the patient portal. The grantee is currently collaborating with two mid-sized, multi-provider clinics that were early adapters of the patient portal. The grantee will use a pre- and post-study design to evaluate the difference between the proportion of patients notified of laboratory results and the time to notification. The research team has been working with sample data to prepare logic rules to adapt pre-existing outpatient guidelines into inpatient guidelines to develop clinical consensus about the appropriate time interval to notify patients of lab results.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Current project plans are delayed, due to issues discussed in the summary section above. A no-cost extension year has been approved. It is expected that all funds will be used by the end of the project.

**Preliminary Impact and Findings:** Focus group participants viewed laboratory monitoring as a critical, time-consuming task integral to their practice. Most believed they commit few laboratory monitoring errors and were surprised at the error rates reported in the literature. They listed various barriers to monitoring, including not knowing which physician was responsible for ensuring the completion of laboratory monitoring, uncertainty regarding the necessity of monitoring, lack of alerts or reminders, and patient nonadherence. The primary facilitator of monitoring was ordering laboratory tests while the patient was in the office. Primary care providers felt more strongly than specialists that computerized alerts could improve laboratory monitoring. Participants wanted to individualize alerts for their practices
and warned that alerts must not interrupt workflow or require too many clicks. Physicians in community practices recognized the potential of computerized alerts to enhance their monitoring protocols for some medications. Interventions to improve laboratory monitoring should address physician workflow issues and increase patient awareness of the importance of fulfilling recommended therapeutic monitoring to prevent ADEs.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
A Systems Engineering Approach: Improving Medication Safety

**Principal Investigator:** Singh, Gurdev, Ph.D., M.Sc.

**Organization:** State University of New York at Buffalo

**Mechanism:** RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017020

**Project Period:** September 2007 – November 2010, Including No-Cost Extension

**AHRQ Funding Amount:** $1,200,000

**Summary Status as of:** November 2010, Completion of Grant

**Target Population:** Elderly*

**Summary:** Adverse Drug Events (ADEs), common in all settings, can frequently be prevented through identification and correction of underlying systemic vulnerabilities. Most methods for estimating health care vulnerabilities are retrospective, uncovering only the ‘tip of the iceberg’. These are fraught with difficulty due to various issues, including gross under-reporting of ADEs and lack of provision for understanding of the total primary care system. Dr. Singh and his team have developed a prospective bottom-up approach, invoking improvement science, adapted from the established failure modes and effects analysis method. This is known as the Safety Enhancement and Monitoring Instrument – Patient centered (SEMI-P) and is highly transferable. This project studied the impact of an information technology (IT)-based SEMI-P on medication safety in primary care practices serving older adults.

This project conducted an experimental design (single-blind randomized block cluster) of a site-level intervention. Outcome assessment focused on medication safety among geriatric patients, in addition to office staff use and application of the IT-based instrument. Participatory research methods assessed provider- and staff-identified barriers to implementation.

The goal of this study was to conduct and publish the results of an IT demonstration project using a human factors approach to geriatric medication safety in order to: 1) provide pilot data for larger confirmatory studies, and 2) possibly develop and market test the IT-based Crew Resource Management (CRM) software via small business innovation research mechanisms for eventual national release.

**Specific Aims:**

- Examine the impact of an IT-based CRM intervention on reducing selected ADEs among geriatric patients in primary care settings by evaluating changes in: 1) number of preventable ADEs that occur, 2) severity of those ADEs, and 3) stage of the medication use process in which they occur (i.e., diagnosis, prescribing, transcribing, dispensing, administration, and monitoring). (Achieved)

- Examine the impact of an IT-based CRM intervention on improving monitoring for geriatric patients who are on persistent medications in primary care settings by evaluating changes in monitoring rates for subjects age 65 and older on: 1) angiotensin converting enzyme (ACE) inhibitors or angiotensin receptor blockers, 2) digoxin, 3) diuretic, and 4) statins. (Achieved)

- Evaluate office staff use and application of the IT-based CRM tool for improving geriatric medication safety in primary care settings by examining use of the IT tool and any changes in safety attitude.
constructs (safety climate, teamwork climate, stress recognition, working conditions, perceptions of management, and job satisfaction). **(Achieved)**

**2010 Activities:** All four sites completed implementation of practice changes in 2010 to address identified ADEs. Practices used the ACORNoffice tool, an IT-based quality improvement tool that supported the practice by prioritizing different methods for improving medication safety, assigning responsibility, and tracking their implementation. Examples include: incorporation of patient education brochures for high-risk medications; inclusion of diagnosis on prescriptions; patient reminders regarding followup; patient-carried medication lists; changes in the way that refill requests are handled; and formation of teams to address ongoing communication problems. The “Indicators” tool within the software was used to define specific measurable outcomes for each initiative and to track success at meeting these objectives over time.

Final interviews and surveys with key practice informants were conducted at completion of the intervention to ascertain barriers, facilitators, perceived benefits, and any potential unintended consequences of the intervention.

In June 2010 the team presented a talk on **Change Management** at the Agency for Healthcare Research and Quality Health IT Grantee and Contractor Meeting. Two papers have been published and another one is under review. An abstract has been submitted to the North American Primary Care Research Group 2011 Annual Meeting.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of November 2010):** The project is completed, and all aims were achieved.

**Impact and Findings:** To measure the impact of the IT-based SEMI-P there are two main outcomes: 1) rate of ADEs in participating practices identified through the use of the trigger tool, and 2) compliance with the Healthcare Effectiveness and Data Information Set (HEDIS) guidelines for laboratory monitoring of patients taking a specified set of chronic medications (ACE inhibitor, diuretic, digoxin, statin, and anticonvulsants).

1) **ADEs:** In the intervention group, ADEs showed a downward trend from 25.8 per 100 patients per year to 18.3 (p=.471 by paired t-test), while the control group showed little change (24.3 to 24.8, p=.899). A two-way ANOVA examining the interaction between time (pre versus post) and group (intervention versus control) showed no significant interaction (p=.407). The intervention proved feasible and demonstrated potential for effectiveness in a variety of ambulatory settings. Future studies should test the intervention on a larger scale, over a longer period of time, and should explore methods for overcoming common barriers.

2) **HEDIS measure for lab monitoring for patients on chronic medications:** At baseline, ACE inhibitors, diuretics, and statins were used by a high proportion of patients, around 40 percent or more at most practices. At all practices, the majority of patients had appropriate laboratory monitoring for these medications. However, compliance was not complete and there was considerable variation between practices, especially for the statin group of medications. There were no statistically significant differences over time or between intervention and control groups. The team plans to publish three papers. The papers will focus on: 1) the barriers and facilitators for practices to improve safety using the CRM; 2) the impact of the CRM on reducing adverse drug events; and 3) the changes in safety culture as a result of the CRM process.
**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination

* AHRQ Priority Population
Using Information Technology to Provide Measurement Based Care for Chronic Illness

Principal Investigator: Trivedi, Madhukar, M.D.
Organization: University of Texas SW Medical Center – Dallas
Mechanism: RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)
Grant Number: R18 HS 017189
Project Period: September 2007 – February 2011, Including No-Cost Extension
AHRQ Funding Amount: $1,196,703
Summary Status as of: December 2010

Target Population: Adults, Chronic Care*, Mental Health/Depression

Summary: Current routine practice in psychiatric settings does not depend on a systematic measurement-based approach but on global clinical judgment. This approach often results in suboptimal care and outcomes. Depression is the most common mental health cause for disability, and treatment should consider the chronic nature of the disorder. Despite the development of effective treatments over the last 30 years, evidence from practice settings continues to show inadequate antidepressant medication treatment in terms of dose and duration. This project applies expertise in algorithm and guideline implementation to the development of a clinical decision support system (CDSS) integrated with an electronic health record (EHR) with the goal of disseminating the principles of evidence-based treatment for depression in large systems of care.

The project focuses on the use of Measurement Based Care (MBC) to improve the quality of care for patients with major depressive disorder (MDD). The EHR-CDSS program will facilitate MBC to improve medication management for patients with MDD by using information technology (IT) to ensure that clinicians are monitoring three critical response domains (symptom severity, side-effect burden, and treatment adherence) using standardized measures. The IT system will also provide decision support during each medication treatment phase and will help prevent medication errors.

This project is a collaboration between the University of Texas Southwestern Medical Center and the Centerstone Community Mental Health Center, Inc. (Centerstone). Centerstone is a behavioral health services provider that provides treatment throughout Tennessee. The first phase of the project was primarily devoted to customization of the CDSS to take into account the specific needs of Centerstone and integration of CDSS into Centerstone’s EHR, CenterNet. The objective of the second phase was to test the effectiveness of the EHR-CDSS to increase clinicians’ use of MBC principles in medication management for patients with MDD.

To fully evaluate effectiveness of the EHR-CDSS, this project involves two research studies. The first study is a comprehensive, system-wide evaluation that will include clinicians using the EHR-CDSS and their patients with depression who require a treatment change, either a change in medication or an increase in dose. The second study is an in-depth evaluation of the impact of the EHR-CDSS on a limited sample of physicians and their patients, directly assessing the use of MBC using a pre-post test design.
Specific Aims:

- Integrate a CDSS that facilitates MBC with physician needs and the EHR at Centerstone. (Ongoing)
- Evaluate EHR-CDSS’s successful promotion of MBC in improving medication management. (Ongoing)

2010 Activities: The integration of the EHR-CDSS and implementation of MBC started in February 2010 and was instituted in 21 clinics (14 rural and 7 urban) that treat approximately 8000 patients with MDD. Data collection was ongoing through the end of the year.

Most Recent Self-Reported Quarterly Status (as of December 2010): The grantee did not provide self reported status.

Impact and Findings: As a first step, a needs assessment was conducted with representative Centerstone clinical staff members to determine how best to integrate the CDSS and EHR. The primary concern expressed by clinical staff members is the increased time burden, in terms of both the length of the treatment visit and the number of treatments visits. Based on prior reports, the research team expected that providing MBC would initially require more time, but once the system was established, the increased visit time would primarily involve the time the patient needed to complete the self-report assessments. Data showed that while patients in the algorithm arm of the trial initially were seen at a higher frequency, the total number of visits over a year were similar in both arms of the trial.

The first study was designed to provide a systematic evaluation of any changes in treatment patterns in the Centerstone System before and after implementation of EHR-CDSS. There was a significant difference in both the total number of visits as well as the patterns of treatment visits. Additional analyses that explore differences based on decision support usages, length of time between visits, and the utilization of MBC assessments during treatment visits are ongoing.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Implementation and Use

* AHRQ Priority Population
Electronic Prescribing and Decision Support to Improve Rural Primary Care Quality

**Principal Investigator:** Veline, James, M.S., M.A.

**Organization:** Avera Health

**Mechanism:**
RFA: HS07-006: Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health Information Technology (IQHIT)

**Grant Number:** R18 HS 017149

**Project Period:** September 2007 – August 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $1,181,866

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Hypertension, Rural Health*

**Summary:** For many chronic conditions, poor patient compliance with prescribed medications can adversely affect treatment outcomes. It is estimated that the compliance rate for patients receiving long-term treatment for chronic conditions, such as hypertension, can be as low as 50 percent. The introduction of electronic prescribing (e-prescribing) systems has the potential to greatly improve the accuracy and efficiency of pharmaceutical treatments. The purpose of this project is to examine whether, in rural ambulatory care settings, the use of an e-prescribing system with clinical decision support related to medication management increases patient prescription adherence, improves the medication management process, and improves health outcomes in hypertensive patients. As part of its overall Avera HealtheCARE™ Initiative, the South Dakota-based health system is working with 28 hospitals and 116 clinics to implement a regional electronic medical record (EMR). The technology package will include advanced e-prescribing software (DrFirst Rcopia) that provides physicians the capability to track the fill status of prescribed medications, and provides interaction alerts, formulary listings, dosing options, patient medication history, and printed wallet-size medication lists. The study examines the impact of the technology on the medication management for patients with hypertension in nine rural or frontier primary care facilities. The project will focus on the following health information technology (IT) systems:

- DrFirst Rcopia electronic prescription management system as a stand-alone product.
- DrFirst Rcopia integrated within the Meditech/LSS Data Systems Medical EMR and Practice Management Suite, the EMR system being implemented by Avera Health in the ambulatory setting. This EMR includes Zynx Health decision support technology and is Certification Commission for Health Information Technology-certified.

The project takes advantage of a staged implementation, first gathering baseline measures and then tracking clinics that are using e-prescribing as a stand-alone tool before moving to an EMR, and clinics that are moving directly to an EMR with integrated e-prescribing. To examine whether patient prescription adherence improves, medical claims data and the e-prescribing patient-fill histories will be used. Improved outcomes will be measured in blood pressure levels and changes in treatment for patients with blood pressure higher than 140/90.

This study is based on the observation of a “natural” process of disseminating and implementing a set of
health IT innovations. As such, the experiment can be characterized as a quasi-experimental design with opportunistic, nonrandom assignment of clinics to the experimental condition.

**Specific Aims:**

- Improve the rate of adherence to prescribed medications among patients with hypertension in rural communities. *(Ongoing)*
- Improve adherence to prescribed medications among patients with hypertension through use of e-prescribing tools in rural care settings. *(Ongoing)*
- Improve health outcomes for patients with hypertension in rural communities through the use of e-prescribing and associated clinical decision support tools. *(Ongoing)*
- Enhance patient and provider satisfaction with the e-prescribing tool. *(Ongoing)*
- Overcome barriers to successful adoption of e-prescribing. *(Ongoing)*

**2010 Activities:** Data collection characterizes the main work of the study team during this period. The project team is collecting data, and the program evaluator and biostatistician have begun analysis. The team will be administering the second round of provider satisfaction interviews and patient satisfaction with care surveys for both the Avera United Medical Clinic and Avera Hand County Medical Clinic just prior to the clinics transitioning from DrFirst Rcopia stand-alone e-prescribing to e-prescribing integrated within the LSS EMR in the first quarter of 2011. Five clinics now use e-prescribing through the LSS EMR.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is mostly on track, meeting most milestones on time. Project spending is roughly on target. The current focus of the project is on sustaining the intervention, and collecting and analyzing data.

**Preliminary Impact and Findings:** A significant degree of variation exists across pharmacy software systems relative to e-prescribing capability and processing. The more sophisticated systems typically found in large chain pharmacies are capable of systematically processing prescription data entry with limited manual entry. Some older, more antiquated systems found in small independent pharmacies offer little automation, requiring the pharmacist to enter nearly all elements of the prescription. The receiving pharmacists most often use SureScripts. Upon further investigation, the project director discovered that the pharmacy certification process essentially certifies that pharmacy software is capable of receiving electronic prescriptions from SureScripts in a standard format. SureScripts certification does not address how the pharmacy software processes electronic prescriptions after receipt. As such, the pharmacists who are required to perform minimal prescription data entry perceive a greater efficiency gain than those required to perform more data entry when processing new electronic prescriptions.

All pharmacists reported the greatest workflow efficiency gains are associated with processing provider responses to pharmacy-initiated renewal requests and a decrease in telephone and facsimile interruptions. Pharmacy-initiated prescription renewal requests are sent electronically to e-prescribing providers with the prescription data elements as they exist in the pharmacy software. Therefore, the responses that come back to the pharmacies are easily accepted by the pharmacy software, requiring limited data entry. Also, telephone calls and facsimile interruptions have decreased as more prescriptions are delivered to the pharmacies by electronic transmission. Pharmacists believe the decrease in interruptions allows them to spend more time providing better quality service to their patients.
Finally, pharmacists were asked to rate their level of satisfaction with e-prescribing on a scale of 1 to 10, with 10 being the most satisfied. Eight of the nine pharmacists reported a satisfaction level of 7, while one pharmacist reported an 8. In general, it appears as though the pharmacist community is relatively satisfied with electronic prescribing.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions and the electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Chronic Mental Health: Improving Outcomes Through Ambulatory Care Coordination

Principal Investigator: Baker, Wende, M.Ed.
Organization: Southeast Nebraska Behavioral Health Information Network, Inc.
Mechanism: RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)
Grant Number: R18 HS 017838
Project Period: September 2008 – September 2011
AHRQ Funding Amount: $1,199,871
Summary Status as of: December 2010

Target Population: Adults, Chronic Care*, Mental Health/Depression

Summary: Providing care for people with mental health illness poses unique and difficult challenges. Without electronic communication, behavioral health providers cannot follow the full treatment path of patients as they move among various providers in urban and rural outpatient settings, mental health hospitals, protective custody, and crisis mental health facilities. This project explores how the exchange of health information between rural and urban providers in the behavioral health field can improve ambulatory patient care coordination and safety across treatment settings. Specifically, the project examines provider barriers to technology acceptance in the behavioral health setting, behavioral health care technology acceptance and adoption, and the effects of health information exchange (HIE) on clinical outcomes.

The development and implementation of a regional HIE in southeast Nebraska will decrease the time it takes for providers to access comprehensive and accurate information, thus creating better access to patient information between and among the provider care team serving an individual with mental illness. This, in turn, will improve continuity of care by providing an electronic link between the multiple service settings that serve Nebraska residents. The provision of basic electronic information to coordinate patient care between behavioral health providers, rural hospitals, and the emergency behavioral health system, will improve the long-term health outcomes of individuals with serious, persistent mental illness.

During the first phase of the project, a committee issued a request for proposals, researched vendor qualifications, and ultimately selected products from NextGen Healthcare, certified by the Certification Commission for Health Information Technology. At the same time, the team began to design the HIE and also conducted a behavioral health provider survey focused on technology acceptance. In the second phase of the project, currently underway, the team will develop the HIE infrastructure, equip provider offices with new or updated technology, and provide training to participating providers. In phase three, the team will implement the HIE in three provider facilities. Once the environment is established, data will be collected to evaluate how timely access to accurate information might improve the quality of care for those experiencing a behavioral health crisis and who have an immediate need for entrance into the emergency behavioral health care system.
Specific Aims:

- Identify provider barriers to technology acceptance. (Ongoing)
- Implement an HIE among three major behavioral health provider facilities. (Ongoing)
- Collect data on how timely access to accurate information relates to quality of care. (Upcoming)

2010 Activities: System design activities continued to focus on organizational development of the Southeast Nebraska Behavioral Health Information Network’s Regional Health Information Organization and on system implementation. The State’s Operational Plan for statewide HIE was approved by the Office of the National Coordinator for Health Information Technology. Early in the year, the electronic Behavioral Information Network (eBHIN) encountered system design challenges as well as problems in recruiting appropriate project management personnel, delaying system implementation by 6 months. However, a new project manager, working with an information technology consultant and NextGen, has been able to adapt the project plan and a new “Go-live” date has been established for June 2011.

In collaboration with the University of Nebraska, Dr. Baker sponsored an “HIE Kick-Off Celebration.” The President of NextGen Healthcare Information Systems joined a group of approximately 100 stakeholders for a presentation highlighting system capabilities and outlining plans for implementation. A data center hosting timeline was developed to facilitate a production environment available in preparation for go-live. An HIE implementation team has been established representing all of the organizations that will be participating in the network. The project manager has been working with this team and NextGen on finalizing the record design and functionality. The referral management and waitlist management functionality has been defined.

Working with a core group of providers identified “super users,” the application has been built with provider-specific information. The eBHIN team continues to work with NextGen and the Magellan Behavioral Healthcare system to design the file transfer protocol for the upload of registration and authorization information to the State of Nebraska. The file transfer structure has been designed and preliminary testing has begun.

Research activities focused on dissemination, data collection, data analysis, and interpretation of a statewide survey, and on completing analysis and interpretation on a provider survey conducted in 2009. The statewide survey focused on the benefits and barriers to electronic sharing of client information. This survey was sent to all practicing behavioral health providers in Nebraska. A total of 2,010 surveys were sent out with 667 respondents. The grant team was pleased with the response rate given the population. Highlights of these findings were presented at the HIE Kick-Off Celebration. A manuscript is being developed to disseminate the findings from the statewide survey. A manuscript summarizing findings from the 2009 provider survey has been published.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project was significantly underspent during this calendar year due to pending acquisition of the Data Center equipment, but project progress is close to schedule with some deviations. Dr. Baker is now moving ahead at a very rapid pace. A go-live date has been set for March 2011, a Data Center hosting timeline is in place, and the application has been built with provider-specific information.

Preliminary Impact and Findings: Most providers reported feeling positively disposed to adopting electronic health records. Many expressed the belief that the decisionmaking about electronic health
records is different in behavioral health than other sectors of the medical community. For instance, most providers believed that information in behavioral health records is more sensitive and the client more vulnerable. Also, some were concerned that the subjectivity of behavioral health information can make electronic sharing a complicated process. Benefits and barriers to technology acceptance, as articulated by providers, were grouped into six theme areas: security and privacy; delivery of behavioral health care; quality of care; adoption and implementation; financial impacts; and business operations.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
## Evaluation of Effectiveness of a Health Information Technology-Based Care Transition Information Transfer System

**Principal Investigator:** Ciemins, Elizabeth, Ph.D.  
**Organization:** Billings Clinic Foundation  
**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health Information Technology (MCP)  
**Grant Number:** R18 HS 017864  
**Project Period:** September 2008 – September 2011  
**AHRQ Funding Amount:** $1,155,371  
**Summary Status as of:** December 2010

### Target Population:  
Adults, Chronic Care*, Rural Health*

**Summary:** This project seeks to improve the coordination of care for patients with two or more chronic conditions who are discharged from a hospital to a rural primary care clinic. The project team will modify the current Billings Clinic electronic health record (EHR) system, the Certification Commission for Health Information Technology-certified Cerner EHR, to develop, implement, and evaluate a Care Transition Information Transfer (CTIT) system for all Billings Clinic Hospital discharged patients and followup providers, with a particular focus on those living in rural communities.

Primary care clinics with EHR-integrated systems will be notified of their discharged patients directly through the Billings Clinic EHR. Primary care clinics outside of the system will access the EHR through a Web-based portal and through the receipt of e-fax, e-mail, or phone messages. The system will provide patients and their primary care providers (PCPs) with discharge information, including medication management, followup visits, laboratory testing and results, and operative reports. Project staff will conduct a prospective study to evaluate whether the intervention improved patient clinical outcomes, system efficiency and process outcomes, and patient and rural provider satisfaction with the hospital discharge process.

**Specific Aims:**
- Develop a health information technology-based CTIT system. (Achieved)
- Evaluate the effects of the CTIT system on:  
  - Clinical and systems-level outcomes. (Ongoing)  
  - System efficiency. (Ongoing)  
  - Satisfaction with care transitions among rural PCPs. (Ongoing)  
  - Patient satisfaction with care transitions. (Ongoing)  
  - Timely communication of patient information. (Ongoing)

**2010 Activities:** Project staff completed the standardization of the discharge process through the development of an EHR-based discharge tool called Housewide Discharge (HWD), which is essentially a nurse-driven checklist and includes both patient and provider discharge information forms. All testing
and refinements were completed on HWD, which went live in April. Patients were also asked to complete satisfaction surveys, with 38 returned so far. Admission, discharge, and transition nurses met with the team and provided substantial feedback, which was addressed. A notification for primary care providers was initiated by the Hospitalist Department. The team continues to work toward an automated notification process, which will increase the reach of notification-receiving providers.

In collaboration with their information systems department, project staff developed these notifications for PCPs, called Discharge Power Notes, which are automatically sent to PCPs via fax or EHR message center. Between October 2009 and September 2010, 1,109 PCP notifications were sent by 15 hospitalists to 203 PCPs in the region. All of these providers were also sent PCP notification satisfaction surveys including a solicitation for process and content improvement suggestions.

The team completed 300 of 400 of the intervention period chart reviews via telephone by registered nurses who have specific experience in medication assessment. Analysis and expert medication reviews continue, with 126 of 300 completed to date, and remain a focus of the project.

Reliability and validity testing for transfer of information to both patients and providers was completed. This illuminated some data quality issues that were then reported back to clinical discharging staff. System modifications were made and additional training of discharging staff took place.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The HWD went live in April. PCP notifications continue, as do intervention period chart reviews, expert medications reviews, and data analysis. Progress is mostly on track, and budget spending is roughly on target.

**Preliminary Impact and Findings:** Seventy-six PCPs completed a survey on their satisfaction with the health information technology discharge notification tool. All but one respondent reported that they wanted to know when their patients were discharged from the hospital, and of those who received a notification, nearly all reported that they then consulted the patients’ EHR. Preliminary data on 300 patients included an increase in PCP followup visits within 30 days of hospital discharge, and a decrease in post-intervention readmission rates.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Enhancing Complex Care Through an Integrated Care Coordination Information System

**Principal Investigator:** Dorr, David, M.D., M.S.

**Organization:** Oregon Health and Science University

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)

**Grant Number:** R18 HS 017832

**Project Period:** September 2008 – September 2011

**AHRQ Funding Amount:** $1,155,147

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*

**Summary:** Patients with chronic illnesses are at risk for complications due to a lack of coordination and quality in a fragmented health care system. This project is investigating whether care for patients with complex needs can be improved by implementing an Oregon Health and Science University-developed integrated care coordination information system (ICCIS) that incorporates population management techniques, patient-centered goals, quality measures, and clinical reminders to support clinical care teams and patient self-management. The three study objectives are: 1) to understand if ICCIS can be implemented among diverse clinics using certified electronic health records (EHRs) and existing standards; 2) to assess if the functions in the ICCIS can be used by the clinics; and 3) to evaluate if these system changes lead to improved patient outcomes.

A randomized controlled trial examines whether six participating clinics can use health information technology (IT) to monitor and deliver care for high-risk patients with a care coordination model (Arm 1) or quality performance model (Arm 2). Three inner-city locations and three rural clinics are participating in the study. Dr. Dorr and his team are evaluating how well care coordination functions are used at the clinics. Measures include indicators of patient engagement, clinic-level quality of care, clinic-level process, and patient health outcomes.

**Specific Aims:**

- Implement the Care Management Plus and ICCIS models. *(Ongoing)*
- Perform a cluster randomized controlled trial in six clinics on the ability to use the IT functions to monitor and deliver care to high-risk patients through a care coordination (Arm 1), or a quality performance model (Arm 2). *(Ongoing)*
- Assess the implementation. *(Upcoming)*
- Understand and disseminate the outcome, benefits, challenges, and unintended consequences from use of these functions for patients and the system. *(Ongoing)*

**2010 Activities:** The team completed a joint analysis of transcribed interviews to determine which combination of features would make the ideal product. Preferred system functions and features were divided into three groups: features to be added before the trial start-date, features to be added during the
trial, and features for future versions of the software. The features that were designated for development before the trial start-date were developed and implemented. Quality measures were selected and defined. A protocol was developed for how and where to extract the data from the EHRs into ICCIS for quality-measure tracking. System features include: notifications that alert providers to past emergency room visits and hospitalizations and upcoming patient office visits; a dashboard that allows comparison of adherence to quality measures between physicians, care teams, and clinics; and a reporting functionality that fosters the care team model.

Staff at all six clinics were trained in care management according to the protocol. The clinics were randomized to the care coordination model or the quality performance model. Baseline information on costs, utilization, and patient panels was collected and patient satisfaction survey data is ongoing.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is mostly on track. The system has been implemented, an assessment was conducted, and the trial began. Project spending is on target.

**Preliminary Impact and Findings:** Baseline data collected from four of the six clinics indicate that 54,406 patients were eligible to be enrolled in care management. Among eligible patients, 37.3 percent had at least one chronic condition and 22.9 percent had two or more chronic conditions. Of those eligible, 3,254 were enrolled and actively followed by care managers. Of these, 87.4 percent had at least one chronic condition and 70.6 percent had two or more chronic conditions. Seventeen percent of enrolled patients had very high risk chronic illness compared with 6 percent in the non-referred population. In terms of the quality improvement measures, of the five quality improvement measures tracked in the four clinics over three quarters, improvements in quality were detected 97 percent of the time (29 improvements out of 30 measurements). Data for the two other clinics will be available in 2011.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
An Electronic Personal Health Record for Mental Health Consumers

**Principal Investigator:** Druss, Benjamin, M.D., M.P.H.

**Organization:** Emory University

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)

**Grant Number:** R18 HS 017829

**Project Period:** September 2008 – September 2011

**AHRQ Funding Amount:** $1,199,379

**Summary Status as of:** December 2010

**Target Population:** Adults, Mental Health/Depression

**Summary:** Poor quality of care may be an important risk factor for accelerated rates of morbidity in people with serious mental disorders. Electronic personal health records (PHRs) can shift the ownership and locus of health records and make them less likely to be scattered across multiple providers and more likely to be longitudinal and patient-centered. Due to the complex health care needs and fragmentation of care faced by individuals with mental health disorders, these patients may benefit from the use of PHRs. However, currently available PHRs typically lack mental health-related modules. To address this gap, the project team adapted an existing PHR to better meet the needs of patients with serious mental illness and one or more co-morbid medical conditions. The investigators are evaluating the impact of this modified mental health PHR (MH-PHR) in a 12-month, randomized controlled trial. During the first 6 months of the intervention phase, a clinical care nurse helps patients access and maintain use of the MH-PHR; during the second 6 months, patients continue use without support. A control group receives education materials about health and self-management. The investigators will evaluate the impact of the MH-PHR on patient self-activation and provider effectiveness in managing chronic disease by conducting chart reviews and interviews with patients. Originally, the mental health module was developed in an older version of an established PHR, the Shared Care Plan; however, the software was not functioning correctly and the module moved to Microsoft HealthVault.

**Specific Aims:**
- Develop a MH-PHR for mental health consumers. *(Achieved)*
- Implement a randomized trial of the MH-PHR. *(Ongoing)*
- Evaluate impact of the MH-PHR. *(Ongoing)*
- Disseminate results. *(Upcoming)*

**2010 Activities:** The primary activities in 2010 were recruitment for the randomized controlled trial and data collection. Initially, some participant attrition occurred as a result of the computer literacy skills required for patients to use the MH-PHR. Investigators devised two approaches to increase recruitment and retention. First, at the time of screening and enrollment, patients are given more detailed information about the computer skills required for the study, and investigators explain the
resources that are available. This helps to ensure that participants know what is expected of them. Second, investigators hired a nursing student who was trained as a computer literacy coach. Each participant is assessed for computer literacy and receives as much help as requested to use the MH-PHR effectively.

By August 2010, the team ended recruitment after enrolling 170 participants, exceeding the enrollment goal of 150 patients. In fall 2010, the first participants completed the 12 month study period; the last participants will not complete the study period until fall 2011. While the study has a low overall attrition rate, there has been a group of participants that has not been actively engaged in the intervention and using the PHR. Researchers conducted focus groups with both engaged and non-engaged participants to investigate reasons for engaging or not engaging. Their findings revealed that some people were not engaging mainly because they did not see the value of using the PHR.

The project team has done several presentations highlighting the project, including at the Tenth Annual Behavioral Health Information Management Conference and Exposition in California and the Agency for Healthcare Research and Quality (AHRQ) Health Information Technology Grantee and Contractor Meeting in June 2010. The project director also participated in “Patient Recruitment: Challenges, Trends and Best Practices”, a joint AHRQ Technical Assistance Webinar on strategies for patient recruitment in April 2010.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is completely on track and and the project budget is somewhat underspent.

**Preliminary Impact and Findings:** The project does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Improving Medication Management Practices and Care Transitions Through Technology

**Principal Investigator:** Feldman, Penny, Ph.D.

**Organization:** Visiting Nurse Service of New York

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)

**Grant Number:** R18 HS 017837

**Project Period:** September 2008 – September 2011

**AHRQ Funding Amount:** $1,199,998

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*

**Summary:** The overall aims of this project are to examine the relative effectiveness and cost-effectiveness of a health information technology (IT) intervention designed to identify patients with complex and/or high-risk medication regimens, provide electronic decision support for clinicians, and provide supplementary information to patients, thereby improving nursing practices and patient outcomes. This project has designed a medication management system to facilitate high-quality care transitions through improved clinician practice and enhanced patient engagement. The intervention to be tested uses an automated algorithm to identify high risk patients and to send an email alert to the home health nurse shortly after the patient’s admission to home care. This intervention also provides the nurse with decision support, including high-risk medication management recommendations that are integrated into the clinician’s visit documentation system and the patient’s electronic health record. The patient also receives educational materials as part of the intervention. The health IT system will be evaluated by comparing the intervention arm to the usual care group in a randomized controlled trial. This project is an extension of the existing Visiting Nurse Service of New York health IT system and uses many of the features that the home health nurses regularly use.

**Specific Aims:**

- Examine the relative effect of the intervention on workflow and medication management practices of home health care nurses. (Ongoing)

- Examine the relative effect of the intervention on the outcomes and service use of patients in the respective intervention groups. (Ongoing)

- Estimate the costs associated with the intervention and subsequent care and compare these costs relative to usual care. (Ongoing)

**2010 Activities:** Implementation of the intervention began in February 2010. An automated process was set up to calculate a Medication Regimen Complexity Index score using electronic medication information that is collected as part of usual care. The nurses of eligible patients were randomized to the usual care group and intervention group on a rolling basis at a two-to-one ratio. Once randomized, the study arm assignment did not change, and all eligible patients of a particular nurse were included in the
same study arm as the nurse’s randomization assignment. The randomization process ended in October 2010 with the enrollment of 500 nurses who were each following at least one patient included in the study. Of these nurses, 165 (33 percent) were randomized to the intervention study arm. A total of 7,960 patients were included in the study, with 2,562 (32 percent) in the intervention arm. Patient outcome interviews were conducted among a randomly selected subset of patients on a one-to-one basis, approximately 60 days after home care admission. The final survey group included 826 patients, 423 (51 percent) of which were selected from the intervention arm.

The analysis team is currently focused on defining variables and obtaining study data from additional sources. An initial data abstraction from the electronic medical record was completed. This abstraction provides information from the decision support tool, including documentation of patient education regarding how to manage complex medication regimens. The full clinical record abstraction and additional datasets are being obtained to describe utilization of home care service and changes in medication regimens. Final data downloads will begin in January 2011 to enable the analysis of study data.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is on time on all tasks. Spending is roughly on target.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use

* AHRQ Priority Population
Using Health Information Technology to Improve Transitions of Complex Elderly Patients from Skilled Nursing Facilities to Home

Principal Investigator: Field, Terry, D.Sc.
Organization: University of Massachusetts Medical School
Mechanism: RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)
Grant Number: R18 HS 017817
Project Period: September 2008 – September 2011
AHRQ Funding Amount: $1,188,157
Summary Status as of: December 2010

Target Population: Elderly

Summary: The incidence of drug-induced injury is high in the ambulatory geriatric population, especially when people with complex health care needs make high-risk transitions to ambulatory settings. This project developed and will evaluate a transitional care intervention: an electronic medical record (EMR)-based medication reconciliation system for medication monitoring and followup of elderly patients discharged from a skilled nursing facility (SNF) to ambulatory settings. The intervention will be evaluated by a three-arm randomized control trial to measure the efficacy of communicating key health information and alerts to outpatient primary care physicians and visiting nurses. Therapeutic monitoring guidelines have been developed and integrated into EpicCare, a Commission for Health Information Technology-certified ambulatory EMR used at the Fallon Clinic. Dr. Field and her team will measure a range of outcomes to determine if the intervention facilitates high quality transitions, including the rate of followup office visits, the rate of appropriate monitoring for high-risk medications, and the incidence of adverse drug events (ADEs). Finally, they will analyze the costs of developing and implementing the intervention. The results from this study will provide important insights into the effective use of clinical alerts and coordinated delivery of actionable information to improve the quality of care delivered to elderly patients transitioning from sub-acute care to the ambulatory setting.

Specific Aims:

• Evaluate the impact of automated scheduling alerts on the rate of followup office visits with an outpatient physician within 21 days of discharge from subacute care. (Ongoing)

• Evaluate the impact of automated monitoring alerts on the rate of appropriate monitoring for selected high-risk medications within 30 days of discharge from subacute care. (Ongoing)

• Evaluate the impact of a health information technology-based transitional care intervention on the incidence of ADEs within 45 days after discharge from subacute care. (Ongoing)

• Evaluate the impact of a health information technology-based transitional care intervention on the incidence of hospital readmission and emergency department visits within 30 days of discharge from subacute care. (Ongoing)

2010 Activities: A significant amount of time in 2010 was dedicated to developing, programming, and
refining the clinical alerts and messages in the EMR. While this took longer than anticipated, the added time allowed the investigators to add a clinical pilot review of the alerts and messages. All of the content sent each day to primary care physicians on discharged patients was e-mailed to one of the project investigators. The team held multiple meetings with clinicians to review and revise the content of the messages and alerts. This process helped ensure that the frequency and content of the alerts and messages are appropriate to lessen alert fatigue and convey clinically useful information. In addition, Dr. Field and the project team completed a review of each discharge to ensure that the programming has correctly captured all relevant information. This helped the team find multiple critical problems that required additional editing to the program. For example, they found specific problems in identifying newly prescribed antibiotics for patients taking warfarin and special medication interactions with diuretics. By fall 2010, programming and revisions were complete; however, the intervention start date was further delayed by the Fallon Clinic’s EMR software upgrade. Now that the upgrade is finished, the team is currently testing each component of the intervention and working with the SNFs and the geriatricians to begin the intervention in early 2011.

During the year, the project team prepared for the evaluation by designing and testing procedures to identify the primary outcomes. Ambulatory visits, hospital readmissions, emergency department visits, and followup laboratory testing will be tracked through transfers of electronic data from Fallon Clinic and Fallon Community Health Plan. The team determined all of the codes and date requirements that will be used for this portion of the study. In addition, the programmers developed and tested a notification system for informing the project’s pharmacist investigators that an eligible patient has been discharged from a SNF and providing them with a flow sheet containing critical information about each discharged patient to guide record review. The pharmacist investigators will be reviewing each discharged patient’s medical records to search for possible ADEs during the period immediately following SNF discharge and presenting them to pairs of physician investigators to determine if the event was an ADE and if it was preventable. The project team has developed and tested all of the procedures and forms for accomplishing this aspect of the project, including signals of possible adverse events based on their previous work and reports in the literature.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is on track in some respects but not others, mainly due to the significant time and resources necessary to develop, program, and refine the alerts and messages and program them into the EMR system. However, by the end of the year, the programming is complete and the intervention is expected to be initiated in early 2011. Spending is roughly on target.

**Preliminary Impact and Findings:** There are no findings at this time.

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
A Longitudinal Telephone and Multiple Disease Management System to Improve Ambulatory Care

**Principal Investigator:** Friedman, Robert, M.D.  
**Organization:** Boston Medical Center  
**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health Information Technology (MCP)  
**Grant Number:** R18 HS 017855  
**Project Period:** September 2008 – September 2011  
**AHRQ Funding Amount:** $1,199,934  
**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Low SES/Low Income*, Medicaid, Medically Underserved, Safety Net, Uninsured

**Summary:** This study will assess the effectiveness of Telephone-Linked Care for Complex Patients (TLC-C) in the care of patients with multiple complex chronic diseases and socio-demographic vulnerabilities who experience increased health care utilization and transitions from ambulatory to emergency department (ED) and hospital care. The objective is to reduce preventable ED and hospital utilization, improve quality of life, increase satisfaction with ambulatory care, improve disease-specific metrics, and reduce net payer costs. TLC-C is a modification of the existing TLC-MultiDisease (TLC-MD) system, which targets patients with multiple chronic diseases. This modification is focused on identifying and intervening for clinical instability (i.e., the patient is at high risk for sudden, severe clinical decompensation). TLC-C uses conversational computer telephony to monitor patients’ multiple diseases and clinical status between ambulatory care visits, detecting changes in clinical status that are associated with disease exacerbation and heightened risk of unscheduled hospitalizations or ED visits. The system monitors patients through virtual visits, detecting and then notifying clinicians of important clinical problems. It also promotes patient self-care management (e.g., medication regimen adherence), scheduled medical visit appointment promotion, and patient preparation for ambulatory care visits.

TLC-C utilizes information reported by patients during the virtual visits and clinical information about the patients that reside in their providers’ clinical data repositories. Information in the repositories is derived from the patients’ clinical encounters in clinics, laboratories, ED and hospital services, and other settings where they receive medical care. Information from the repository is transferred automatically to TLC-C daily. This information includes diagnoses, prescribed medications, scheduled primary care visits and other clinical encounters, patient’s disposition, laboratory and other test results, and selected other information used by TLC-C. In addition, the investigators implemented an expert system for directing the patient user to TLC-C modules likely to be of special use and interest to the patient.

A multi-method evaluation study of the patients, the providers, and the practice will include a two-arm randomized clinical trial of TLC-C versus usual care for patients with two or more chronic diseases. The trial will evaluate the system in 440 patients followed for 6 months. The primary outcome will be acute hospital care utilization (unplanned hospitalizations and ED visits). Secondary outcomes will include
patient quality of life, satisfaction, ambulatory appointment show rate, and net payer costs. Evaluation methods will include formative and summative qualitative studies of the implementation of the system; its use and performance over time; and its impact on the patients, the providers, and the practice as a whole.

**Specific Aims:**

- Design, program, and lab test the system. *(Achieved)*
- Pilot test the system. *(Achieved)*
- Redesign and reprogram the system based on the pilot. *(Achieved)*
- Conduct an evaluation study. *(Ongoing)*
- Recruit patients. *(Ongoing)*
- Evaluate project. *(Upcoming)*
- Analyze study data. *(Upcoming)*
- Sustain and disseminate the system. *(Upcoming)*
- Write the final report and other manuscripts. *(Upcoming)*

**2010 Activities:** The team has modified TLC-MD so that it contains additional content that address the needs of patients with multiple chronic diseases who transition to ambulatory care from acute care settings (e.g., an acute care hospital inpatient stay or an ED visit) for an acute episode related to one or more of their chronic diseases. Content modifications included: 1) development and completion of a new office visit module, created to promote outpatient visit adherence and to activate patients for visits with their physicians; 2) reformulation of the medication adherence module to take less time and be easier for participants to use; 3) modifications of disease modules for coronary artery disease (CAD) and congestive heart failure to integrate information from the electronic health record with information collected by TLC for these chronic diseases. Symptomatic and asymptomatic CAD was added because of its prevalence and association with ED visits and unplanned hospitalizations; hypertension was deleted because it is not an ambulatory care sensitive condition and diabetes was removed because of its complexity.

The team engaged key members of the Boston Medical Center Information Technology group in a process of specifying exactly what data will be sent from the clinical systems to the TLC system. This will occur each night for variables that will be used to modify scripts for active TLC-MD patients. Data transferred included medications, future scheduled appointments and tests, the status of prior appointments and tests (e.g., no show, cancelled, attended), dates of unplanned utilization (e.g., urgent care, ED, hospitalization), dates of discharge from hospitalization, and allergies. The protocol was tested to ensure successful transfer of information.

By the end of 2010, the team had enrolled 29 subjects (15 in TLC-C group and 14 in the usual care control condition). Eligibility criteria were modified, with institutional review board approval, to drop the requirement that the potential subjects have any specific disease. Subjects who do not have any of the listed diseases will not get disease-specific guidance on the phone system, but will receive the remainder of the TLC-C system, including medication support and visit adherence promotion. These changes in the eligibility criteria have resulted in increases in the number of study subjects recruited without any negative effects on the study intent and design. Further, the team will be able to perform subgroup analyses that focus on the original hypotheses or sample (e.g. looking at people who have one or more disease specific interventions when compared with those that receive the general intervention).
Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is on track in some respects but not others. The budget is significantly underspent, (more than 20 percent) due to earlier delays in programming of modifications.

Preliminary Impact and Findings: There have been no findings to date because the trial has just started.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Randomized Control Trial Embedded in an Electronic Health Record

**Principal Investigator:** Kahn, James O., M.D.

**Organization:** University of California San Francisco (UCSF)

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs through Health Information Technology (MCP)

**Grant Number:** R18 HS 017784

**Project Period:** September 2008 – August 2011

**AHRQ Funding Amount:** $1,199,928

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, HIV/AIDS

**Summary:** HIV/AIDS is now considered a chronic illness. Therefore, the application of the chronic care model (CCM) to this disease may lead to improved outpatient care and easier, safer clinical transitions for HIV-infected patients. Clinical information systems (CISs) are a key element in the CCM. While most CISs have focused on the provider as the recipient of critical data, CISs that target patients might also improve health care. The electronic personal health record (ePHR) is a recent, increasingly common patient-oriented information system that allows patients to view data necessary to guide practical outpatient decisions and provide portability of clinical data between health care venues.

This project is expanding an existing secure ePHR, known as myHERO (Healthcare Evaluation Record Organizer), to provide information, Web-based tools, and reminders to promote self-management, increase safer clinical transitions, and improve outcomes among patients with HIV/AIDS in a public health setting. myHERO is integrated with HERO, the electronic health record system used by the University of California at San Francisco’s Positive Health Program, a primary care clinic that specializes in care for patients with HIV/AIDS. The enhancements included adding established tools to assess tobacco use, depression, anxiety, and medication adherence, and to translate responses into numeric scores that trigger decision-support for patients and direct them to resources or Web-based interventions.

A 12-month randomized controlled trial is evaluating the impact of the ePHR on clinical outcomes including: quality of the patient-clinician interaction such as trust, communication, and health promotion; changes in patient behaviors such as adherence to antiretroviral medications and tobacco use; clinical outcomes such as CD4+ T-lymphocytes, detectable plasma HIV RNA, depression, anxiety, and quality of life; safety, such as documentation of drug allergies, adverse events, and medication reconciliation; and utilization, such as office visits. In addition, the project team will evaluate patient and clinician experiences in engaging with the PHR tools including patient access and use of support for tobacco cessation, depression abatement, anxiety reduction, adherence improvement, and patient and clinician satisfaction with the ePHR.

This study builds on existing resources, experience, and expertise to provide a detailed evaluation of ePHR usage and its impact on health care outcomes in a public health setting. The ePHR could be a cost-effective approach to reducing health disparities and bridging the digital divide for underserved patients.
The results of this study could have wide application and a potentially large impact on public health.

**Specific Aims:**

- Build the infrastructure and content of the ePHR to provide patient decision support, information retrieval, and communication tools. *(Achieved)*
- Evaluate patient and provider experiences using the ePHR, including patient access and use of health education materials and patient-provider satisfaction with the ePHR. *(Ongoing)*
- Assess outcomes, including quality of patient-provider interactions, changes in patient behaviors, clinical outcomes, safety, and health services utilization. *(Ongoing)*

**2010 Activities:** Grantee did not report 2010 activities.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Grantee did not provide self assessment.

**Preliminary Impact and Findings:** This project does not have any reported findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use.

* AHRQ Priority Population
Improving Care Transitions for Complex Patients through Decision Support

**Principal Investigator:** Lobach, David F., M.D., Ph.D., M.S.

**Organization:** Duke University

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)

**Grant Number:** R18 HS 017795

**Project Period:** September 2008 – September 2011

**AHRQ Funding Amount:** $1,198,254

**Summary Status as of:** December 2010

**Target Population:** Chronic Care*, Medicaid

**Summary:** The care of patients with complex health care needs is often fragmented because they receive care from multiple providers in disparate locations and because information related to this care is frequently not transmitted between providers or locations. Inadequate inter-provider communication and care coordination significantly lowers care quality and compromises patient safety. This project seeks to improve outcomes, quality, and coordination of care for patients with complex health care needs by facilitating the availability of information following three types of care transitions into ambulatory care: hospital discharge, emergency department (ED) discharge, and specialty care referrals.

The project builds upon the Community-Oriented Approach to Coordinated Healthcare (COACH), an existing regional health information exchange (HIE) network that connects providers serving Medicaid beneficiaries in rural and urban North Carolina. It will also implement and utilize an open source clinical decision support (CDS) application called ClinicaCDS to detect care transitions, and produce and send care event summary reports to patients, patients’ assigned medical homes, and care managers. These intervention notices will support traditional clinic-based models of care as well as models that incorporate population health management and cross-disciplinary teams.

The impact of the interventions will be evaluated by randomizing patients by family unit with complex health care needs into one of three arms: 1) information on care transitions is sent to patients and clinic-based caregivers; 2) information on care transitions is sent to patients, clinic-based caregivers, and care managers; and 3) no information is sent (i.e., usual care). The primary outcome measure is the overall rate of ED use. In addition, the economic impact of the intervention will be measured relative to usual care. Information-augmented care transitions between sites are expected to improve care coordination, quality, and appropriateness of care.

**Specific Aims:**

- Enhance the existing HIE network and decision support tool. *(Achieved)*
- Implement and evaluate the intervention. *(Ongoing)*
- Conduct the economic attractiveness assessment. *(Upcoming)*
- Disseminate the findings. *(Upcoming)*
**2010 Activities:** During 2010, the team made significant enhancements to the COACH HIE including completing the programming necessary for the importation of Admission/Discharge/Transfer (ADT) data feeds for the five participating hospitals. They are now receiving nightly ADT data files which will be used to generate notifications for care managers and primary care clinics regarding patient hospital discharges and ED encounters for Medicaid patients with complex care needs. In addition, the project team identified a method for identifying specialty encounter visits based on current procedural terminology (CPT)-4 evaluation and management codes, location of care delivery, and the specialty of the provider billing for a specialty care service in the Duke University Health System. They validated this method by conducting patient chart reviews.

The project team encountered delays during the year in programming the interventions into the Duke proprietary CDS system due to turnover of multiple staff and the learning curve associated with familiarizing programmers with the proprietary CDS. Therefore, the team decided to migrate to ClinicaCDS for this project with the hope that the application would be easier to develop, configure, implement, and maintain. The team was able to identify several modules that were part of the proprietary CDS system that could be reused in the new system. Upon completion of the specifications and requirements, the programmers “roughed out” all of the required components by creating prototypes of the interventions beginning from the detection of a care transition. This process allowed the team to demonstrate that all of the necessary components were functional by the end of October 2010. The software development effort during the months of November and December focused on refinement of these newly created rough components.

Because of a mandate by North Carolina Medicaid to reduce costs for hospitalizations and ED utilization, a second phase of the project was added. The network partners requested daily notices of hospital discharges and ED encounters from data in the COACH HIE. These requested notices are similar to the care manager-oriented interventions for the proposed study, although the care transition notices are driven from billing instead of ADT data. To accommodate this request, a new Phase 1, which provides care manager notices derived from existing claims data for operational needs on approximately 47,000 Medicaid beneficiaries, was implemented in December 2009. The 12 month randomized controlled trial (RCT), now called Phase 2, will provide the originally proposed study interventions for approximately 4,600 patients with complex health needs. The planned start for Phase 2 is expected to roll out in February 2011, pending the software migration and the programming of the interventions into ClinicaCDS.

During the year, the project team devoted considerable time to refining and finalizing the content for the four intervention documents: care event summary reports, patient letters, care event notices, and release of information requests. This process included completing the final focus group with patients to inform the content of the patient letters and the Health Education Brochures; defining the data elements and completing the data extraction for patient specialty care encounters for the care event summary reports and care event notices; working with the primary care sites to ensure that the content in the documents is appropriate; and submitting and receiving final approval from the State Medicaid office. In late 2010, the clinical research coordinator and the research assistant distributed materials and conducted onsite visits to introduce the project to the participating primary care clinics.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is on track in some respects, but not others, and project budget to date is significantly underspent, more than 20 percent. However, the project team made adjustments and there is a viable plan for meeting all project aims. Part of this delay was due to the mandate by North Carolina Medicaid while other delays involved the staffing retention and CDS migration described above.
**Preliminary Impact and Findings:** Evaluation outcomes will not be available until the RCT is complete.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
Improving Pediatric Cancer Survivorship Care through SurvivorLink

Principal Investigator: Mertens, Ann C., Ph.D.
Organization: Emory University
Mechanism: RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)
Grant Number: R18 HS 017831
Project Period: September 2008 – September 2011
AHRQ Funding Amount: $1,199,198
Summary Status as of: December 2010

Target Population: Cancer, Pediatric

Summary: As the numbers of survivors increase, cancer survivorship has become a national public health priority. This is particularly true for childhood cancer survivors for whom cancer therapies, with overall cure rates of 75-to-80 percent, are highly successful. Yet high-quality, individualized survivorship care is challenging due to: 1) multiple transitions in care among primary and specialty care providers, and 2) the lack of knowledge about survivor issues among providers, patients, and their families.

This project aims to address these challenges by building the SurvivorLink system, a personal health record that will improve pediatric cancer survivors’ transition to primary and specialty care for pediatric and increase patient, family, and provider knowledge about survivor issues. SurvivorLink will include a cancer treatment summary, individualized risk- and late-effects screening profiles, and other clinical information needed to provide high-quality long-term care to survivors. In addition, there will be educational materials that improve awareness of survivorship issues and best practices in survivor care.

SurvivorLink has three target user groups: patients and families; providers; and researchers. For this pilot study, patient, family, and provider participants will be recruited through the five cancer treatment centers in the State of Georgia and through Georgia Comprehensive Cancer Registry records. The impact of SurvivorLink will be evaluated by measuring outcomes related to both SurvivorLink utilization and the effects that SurvivorLink utilization has on aspects of survivor care, including patient and provider awareness of survivor issues and percentage of patients receiving recommended survivorship care.

Specific Aims:
• Collect data on pediatric cancer survivors in SurvivorLink. (Ongoing)
• Facilitate the exchange of clinical information at key transitions. (Ongoing)
• Provide patients with easy access to individualized educational materials and evidence-based late-effects screening recommendations. (Ongoing)
• Provide researchers with longitudinal information on incidence of late effects in pediatric cancer survivors. (Upcoming)
**2010 Activities:** The project team conducted focus groups and semi-structured interviews with providers, patients, and parents to understand the needs of these groups. The focus groups indicated that providers want a system that allows efficient access to patient health information before the patient visit. Patients and their parents expressed concern about privacy from insurance companies, colleges, and employers. As a result, the patient-parent portal was designed with special attention to security and privacy. Similar to a social networking site, patients and parents can invite their primary care doctor and other physicians to access their survivor health plan online to facilitate information exchange, and can un-invite them at any time. When patients or parents sign up, they receive a survivor health care plan and give permission for their providers to post information. The portal highlights tailored information for individual patients based on their risks. Patients and parents are also able to link their current medications with relevant health links and to store other information as scanable documents. As an added security measure, patient and parents are able to monitor who looks at their patient information.

Dr. Mertens held several seminars to educate providers, including pediatricians, social workers, oncologists, and endocrinologists about SurvivorLink. Additionally, all pediatricians in the State were notified of the system. To date, 55 providers have registered. In September 2010, patient and parent recruitment was initiated at the largest clinic via mailings and followup phone calls. A total of 26 users have registered (19 parents and 7 patients) toward the recruitment goal of 500. In 2011, patient and parent recruitment will begin at the other clinics. Dr. Mertens will also recruit patients and parents from community-based pediatric cancer support groups.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is meeting most milestones on time. Project spending is roughly on target.

**Preliminary Impact and Findings:** Findings from focus groups with providers and parents of pediatric cancer survivors were incorporated into the development of the parent-patient portal of SurvivorLink. During followup recruitment phone conversations, the project staff learned that most parents were not familiar with the importance of survivor care.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* *AHRQ Priority Population*
**e-Coaching: Interactive Voice Response-Enhanced Care Transition Support for Complex Patients**

**Principal Investigator:** Ritchie, Christine S., M.D., M.S.P.H.  
**Organization:** University of Alabama at Birmingham (UAB)  
**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)  
**Grant Number:** R18 HS 017786  
**Project Period:** September 2008 – September 2011  
**AHRQ Funding Amount:** $1,199,999  
**Summary Status as of:** December 2010

**Target Population:** Chronic Care*, Chronic Obstructive Pulmonary Disease, Congestive Heart Failure, Elderly*

**Summary:** For complex medical patients, the transition from hospital to home-based care is a vulnerable period, where the patient is at high risk for adverse events, including the experience of a medical error or loss of community tenure. Studies examining the Care Transition Intervention (CTI), which provides nurses who conduct home visits, telephone followup, and provide assistance at and after discharge report that it is a successful program but is costly and not feasible in settings serving geographically dispersed populations.

Dr. Ritchie and her team developed a cost-efficient technological solution that is based on the CTI: an interactive voice response (IVR)-supported care transition coaching intervention, e-Coach, that supports complex medical patients as they transition from hospital to home-based care. The e-Coach, using the TeleSage software application, supports patients with medication self-management assistance, maintenance of a paper-based personal health record (PHR), timely followup with primary or specialty care, and identifies ‘red flags’ indicating worsening of the patient’s condition. The e-Coach also has a Web-delivered monitoring dashboard which displays data in a meaningful way for the care transition coach to monitor collected patient data, listen to patient messages, and record responses. The team is currently performing a randomized control trial (RCT) and recruiting patients with congestive heart failure (CHF) or chronic obstructive pulmonary disease (COPD) who are discharging from the hospital. During 2011, the team will be completing the trial and evaluating the use of the e-Coach by patients, as well as evaluating the impact of the e-Coach on patient outcomes, including 90-day rehospitalizations, successful community tenure over a 3-month period, medication discrepancies, and patient self-efficacy. In addition, the investigators will quantify the cost associated with the e-Coach. If e-Coach is successful, it is likely to be easily disseminated and could result in substantial avoidance of medical errors in the hospital-to-home transition period, along with notable reductions in the risks and costs of rehospitalizations.

**Specific Aims:**
- Randomize 720 patients to the e-Coach intervention or to usual care. (Ongoing)
• Evaluate the use of the e-Coach system by patient and health care providers. (Ongoing)

• Evaluate the effect of e-Coach on patient outcomes, including 90-day rehospitalizations, successful community tenure at home after discharge from the hospital, and patient self-efficacy based on the Care Transition Measure. (Ongoing)

• Quantify the costs associated with the e-Coach intervention. (Ongoing)

2010 Activities: Pilot testing of the e-Coach intervention, also called the UAB Back to Home Support Program, for patients with CHF was conducted in December 2009. After minor refinements were made to the dashboard and IVR system and tested, Dr. Ritchie and her team began study recruitment for the RCT in February 2010. In April and May 2010, the team implemented the pilot for patients with COPD to test feasibility and gather feedback from COPD patients on the use of the system, enunciation of questions, and ease of understanding question options. The dashboard for the COPD group was completed and the team began recruiting COPD patients during the summer.

The primary challenge experienced by the team relates to recruiting patients, mainly due to hospital census limitations and by their eligibility criteria. The team initiated several approaches to increase their enrollment rate, including expanding the screening protocols, engaging in daily “environmental scanning” throughout the two study hospitals, and communicating regularly with staff in areas with high volumes of COPD and CHF patients. In addition, they adjusted Care Transition Coach schedules to increase the availability of coaches for evening and weekend participant recruitment. Finally, research assistants trained in motivational interviewing to enhance skills in overcoming potential barriers to enrollment and as a strategy to increase effectiveness of the enrollment process.

As of the end of December 2010, the team enrolled 330 patients in the study representing 47 of the 67 counties in Alabama and seven surrounding States, demonstrating that the intervention effectively bridges geographic boundaries. Data collection is scheduled to occur at 1 week, 1 month, and 3 months following hospital discharge. The response rate for followup calls and data collection at the 90 days post discharge time is 94 percent. While recruitment is below their goal of 720 participants, the team is pleased with their less than 10 percent attrition rate and 82 percent IVR survey completion rate.

The team refined the data collection tool used for enrollment and capture of baseline data to minimize potential data entry errors and to be more visually distinct and user-friendly. Several data entry fields within close proximity to one another were moved to provide a less cluttered visual presentation and to minimize potential error during the data entry process.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is on track in some respects, but not others, and the project budget is somewhat underspent, 5 to 20 percent. There were delays in programming of the IVR software and e-Coach dashboard in 2009, leading to delays in the initiation of the RCT. In addition, as described previously, the project team had difficulty with recruitment of eligible study participants. They have initiated several strategies to increase enrollment and will request a no-cost extension to complete the project.

Preliminary Impact and Findings: Preliminary findings include the high receptivity from patients on the intervention, a higher anticipated response rate among patients receiving the IVR-supported intervention, and a reduction in the number of rehospitalizations for intervention versus the control group. In addition, an impact of this project has been the geographic reach they have been able to achieve through the use of IVR technology as opposed to in-home nursing care transition support as evidenced...
by their enrollment of participants from 47 of the 67 counties in the State of Alabama, and individuals living in seven different States.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
**Using Electronic Data to Improve Care of Patients With Known or Suspected Cancer**

**Principal Investigator:** Singh, Hardeep, M.D., M.P.H.

**Organization:** Baylor College of Medicine

**Mechanism:** RFA: HS08-002: Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health Information Technology (MCP)

**Grant Number:** R18 HS 017820

**Project Period:** September 2008 – September 2011

**AHRQ Funding Amount:** $1,199,531

**Summary Status as of:** December 2010

**Target Population:** Adults, Cancer: Colon, Lung, and Prostate, Veterans

**Summary:** Patients with known or suspected cancers transition through several ambulatory care settings to receive timely diagnosis and treatment. The survival benefit conferred by early diagnosis and treatment depends on well-coordinated care. This project tests the use of health information technology (IT) to identify patients where the diagnosis of specific cancers (prostate, lung, and colon) has been delayed. The project develops, tests, and refines queries to mine a clinical data warehouse for triggers that might signal diagnosis delays using data from the Veterans Administration’s (VA’s) electronic health record (EHR), the Computerized Patient Record System (CPRS) and Veterans Health Information Systems and Technology Architecture (VistA); and EMRx, the Scott and White Health system’s EHR. Providers in the intervention group of the upcoming randomized, controlled trial (RCT) will receive electronic communication and surveillance if potential delays in their patients’ diagnostic work-up are identified by the triggers. Outcome measures, obtained through chart reviews, consist of time intervals between several key steps in the optimal pathway of diagnosis.

**Specific Aims:**

- Identify patients with cancer-related diagnostic delays using trigger-based data mining of an EHR repository. *(Ongoing)*
- Determine the effectiveness of a health IT-based intervention to facilitate cancer diagnosis as compared with usual care. *(Upcoming)*

**2010 Activities:** During 2010, Dr. Singh and his team finalized the development of the colon cancer triggers. This process included a medical chart review of 180 charts at both the VA and non-VA sites to validate the triggers to determine whether the identified patients were truly at risk for delayed colon cancer diagnosis. Analysis of the data is ongoing and the preliminary results have been accepted as an oral presentation at the 2011 VA Health Services Research and Development Service Annual Meeting in Washington, D.C.

The team also applied the framework for developing colon cancer triggers to create triggers to identify those at risk for delayed lung and prostate cancer diagnosis. The framework is comprised of three steps to guide the design and development of electronic triggers that identify potential and actual delays in
diagnosis using data from integrated EHRs. The framework involves: mapping all followup events expected to occur in response to a particular diagnostic clue; verifying the trigger’s logic as it is developed (e.g. anemia not followed by colonoscopy in a defined time period); and providing continuous and iterative feedback to improve the trigger.

Each trigger required mining more than 200,000 medical records over a 6-month period. A team composed of clinical providers and a programmer met weekly to define the appropriate clinical criteria and determine how to best implement them, taking into account the limitations of the health information systems at the sites. Each trigger is composed of several clinical rules (e.g. criteria). Each rule required multiple record review sessions, during which providers tested the triggers by identifying the documented clinical evidence that supported or contradicted the triggers’ rules.

By the end of 2010, the triggers for prostrate cancer were developed; validation at both the VA and non-VA sites is underway. The development of the lung cancer triggers are close to completion and data validation will start in early 2011. In parallel, the team is awaiting final Institutional Review Board approval at both sites for testing the interventions in a RCT, scheduled to begin in March 2011.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Project progress is on track in some respects, but not others and budgeted funds are somewhat underspent. The initial deadline was not met due to delays in 2009. This included the announcement of a new national VA policy on developing data repositories for research purposes which delayed the creation of the data warehouse for this project at the VA. In addition, the development of the colon cancer trigger took more time than anticipated. However, the experience and knowledge gained informed and expedited the development of the triggers for prostate and lung in 2010 and the team does not anticipate any other significant delays.

Preliminary Impact and Findings: Dr. Singh and his team conducted a pilot to test the colon cancer triggers and assess if the patients identified were truly at risk. They found that of the 89,187 patients to whom the trigger was applied, 595 patients were identified as at risk. Of the 120 patient charts reviewed, 90 (75 percent) were true trigger positives. This observation indicates EHR-based trigger methods are potentially useful to detect potential delays in colorectal cancer diagnosis.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use
**Surveillance for Adverse Drug Events in Ambulatory Pediatrics**

**Principal Investigator:** Bailey, Thomas, M.D.

**Organization:** Washington University in St. Louis

**Mechanism:** RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)

**Grant Number:** R18 HS 017010

**Project Period:** September 2007 – August 2010, Including No-Cost Extension

**AHRQ Funding Amount:** $992,600

**Summary Status as of:** August 2010, Conclusion of Grant

**Target Population:** Cancer, Chronic Care*, Cystic Fibrosis, Pediatric*, Sickle Cell Anemia

**Summary:** Adverse drug events (ADEs) comprise one of the largest categories of adverse events in the principal studies examining the epidemiology of patient safety. Measurement of ADEs was identified as a critical patient safety metric in the Institute of Medicine’s 2004 report on patient safety and in their 2001 National Healthcare Quality Report. Measuring the incidence of ADEs in care environments is essential to: 1) establish a baseline performance metric to measure improvement; 2) separate medication errors and system failures that result in harm to patients from those that do not; and 3) accurately direct interventions to prevent the failures that are harmful. Despite extensive literature on medication safety, medication errors, and adverse drug events in adult populations, little is known about the frequency and nature of these events in children and less is known about ADE incidence in children with chronic disease.

This project uses automated surveillance to measure the incidence of outpatient ADEs suffered by children with sickle cell disease, cystic fibrosis, or cancer, either in the emergency department (ED) or during the transitions between hospital admission and discharge. The project will analyze data generated from BJC HealthCare system, which includes the St. Louis Children’s Hospital. The St. Louis Children’s Hospital ED uses the Wellsoft ED computer system and the McKesson Corporation’s Certification Commission for Health Information Technology-certified Horizon Expert Documentation for inpatient care. The BJC/Washington University Medical Informatics Laboratory group uses its rule-based expert systems architecture for discrete data, and the open-source natural language processing system, cancer text informatics extraction system for textual data, to automatically scan laboratory, pharmacy, demographic, documentation, and diagnostic code data from the target populations for “signals,” or data combinations that suggest the occurrence of an ADE. This automated system is being evaluated for efficiency (positive predictive value [PPV] and time and resource efficiency) and effectiveness in ADE detection compared with targeted explicit chart review. The project will also examine the impact of access to ADE metrics by practitioners. The data from the system will be used to improve strategies for medication use safety in clinic, emergency, and inpatient environments.

**Specific Aims:**

- Implement an automated surveillance system for measuring the incidence of ADEs occurring in the outpatient setting (including the emergency department) in pediatric patients with specific chronic...
diseases that result in the need for emergency department care or admission to the St. Louis Children’s Hospital. (Achieved)

- Use the automated surveillance system for measuring the incidence of ADEs occurring in these patient populations during transitions in care from outpatient to inpatient setting, e.g., originating during the admission process. (Ongoing**)
- Use the automated surveillance system to measure the incidence of ADEs in the target pediatric populations within four weeks of discharge. (Ongoing**)
- Evaluate the performance of the event detection system as employed in the three above aims. (Ongoing**)

**2010 Activities:** The chart review was initiated during this period with a sample population size of 394 patients randomly selected from 1,990 total study patients. The sample was stratified by patient condition: sickle cell, cystic fibrosis, or cancer. A study pharmacist reviewed the chart review population for ADEs using a chart review tool designed with prompts for detecting ADEs. For each prompt, the pharmacist assessed if an ADE occurred and documented the ADE. Another study pharmacist matched chart review ADEs to ADEs detected by automated alerts. A study physician reviewed every chart review event that was not found by the automated method, or was found by the automated method but there was a difference in the assessment of whether an ADE was present.

Study pharmacists re-classified the automated system alerts into events. Events were defined as a single alert or collection of alerts that the reviewer believed to be an ADE or potential ADE. The study team defined the standard for the comparison as the combination of ADEs found by both the automated system and chart review, as determined by expert review. Using this standard, they will produce three different comparisons.

1. Comparison of chart review events alone with the standard.
2. Comparison of the pharmacist assessment of alerts generated by the automated system with the standard.
3. Comparison of the automated system without pharmacist review of the alerts with the standard.

The second and third comparisons highlight the difference between the number of detected true events and the number of alerts to detect these events. Each comparison will include sensitivity and PPV. Negative predictive value and specificity will not be established as the number of events that were not found by either chart review or the automated system is unknowable.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of August 2010):** Project progress is on track. Project spending was significantly under budget due to delays in the project and transition to a new principal investigator.

**Preliminary Impact and Findings:** In the study population of 1,990 patients, there were 212 discrete alerts that detected 73 ADEs, and 1,055 natural language processing (NLP) alerts that detected 70 ADEs. Preliminary analysis shows the system is discovering harmful ADEs in 1.3 percent of inpatient admissions with a PPV of 13 percent. Data suggest that the rate of NLP-detected ADEs per year (i.e., alone, not counting ADEs detectable with discrete alerts) in the study populations was approximately 6.8 events per 100 patients per year; this is the same order of magnitude described by studies in adult populations.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population

** Several aims were not completed prior to the scheduled conclusion of the grant period, however, work continues on the aims.
Closing the Feedback Loop to Improve Diagnostic Quality

Principal Investigator: Berner, Eta, Ed.D.
Organization: University of Alabama at Birmingham
Mechanism: RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Through Health Information Technology (EQM)
Grant Number: R18 HS 017060
Project Period: November 2007 – August 2011, Including No-Cost Extension
AHRQ Funding Amount: $998,509
Summary Status as of: December 2010

Target Population: Adults, Cerebral Palsy, HIV/AIDS

Summary: Determining whether a diagnosis is correct in an outpatient setting may be very difficult. A surrogate measure of diagnostic quality is whether the diagnosis appropriately resolves the reason for the patient’s visit when new complaints or diagnoses arise during the visit. The proposed system focuses on mitigating the harm from an initial diagnosis that does not resolve the patient’s underlying problem. The hypothesis is that harm can be prevented or mitigated by providing rapid feedback to the physician, thereby closing the diagnostic loop.

The project is developing automated processes for proactive followup and ongoing rapid feedback to physicians in two types of outpatient settings: three ambulatory clinics – the University of Alabama at Birmingham (UAB)-Huntsville Family Practice, the UAB-HIV Clinic, and United Cerebral Palsy (UCP) – and one emergency department (ED) setting (Shands-Jacksonville). The ambulatory sites all have different electronic health records (EHRs). The EHRs are the Certification Commission for Health Information Technology (CCHIT)-certified WorldVistA EHR (UCP), the Touchworks EHR (UAB), and a non CCHIT-certified proprietary EHR (UAB-HIV). In the ED study, the systems are the CCHIT-certified McKesson Horizon Patient Folder and a proprietary ED system (Xpress Charts) that provides a computer-generated paper template customized to the patient’s chief complaint.

Different interventions are used at each type of site. The clinic site intervention is an interactive voice response (IVR) system that collects followup data for a feedback report to physicians on patient health status and medication adherence. The feedback report uses an interface between the EHR and a database that can be integrated with a variety of systems. The ED intervention is an automated followup and feedback report to the ED physicians on the final diagnoses of patients who were admitted to the hospital as compared to their initial ED diagnoses.

Providers’ responses to the feedback, their satisfaction with the feedback process, the impact on diagnostic and therapeutic quality, response to use of the IVR and ED feedback systems, and the use of the feedback by physicians will be assessed as outcome measures. For the clinic sites, additional assessments include patient satisfaction and impact on health care costs.

Specific Aims:

- Develop a system within three different ambulatory EHR systems in three different types of ambulatory settings that includes proactive followup of patients’ response to treatment (including
medication adherence and adverse events) and feedback to health care providers. *(Achieved)*

- Assess the impact of automating the followup and feedback system. Impact will be measured in terms of: 1) diagnostic quality; 2) prevention of adverse events; 3) patient satisfaction with clinical care; and 4) health care costs. *(Ongoing)*

- Develop and evaluate an automated system for feedback to emergency medicine physicians of the concordance between their initial diagnoses and patients’ final diagnostic outcomes. *(Ongoing)*

**2010 Activities:** The development of the feedback system in each setting was completed and feedback was provided to physicians in each of the active study sites. The IVR system was developed and implemented to collect feedback data from two sites, the UAB HIV clinic and the Huntsville Family Medicine clinic. The IVR was adapted to use the voice of one of the project interviewers so that the patients would hear a familiar voice. Since the patients in the second clinic did not know their interviewer, the team used the same voice but customized the recordings for the clinic. Using the IVR, they completed data collection from patients in both clinics; the information was then fed back to their physicians.

The process for providing feedback to emergency medicine physicians was begun. It was initially done by having project staff meet directly with the residents. However, despite being well-received, that process did not progress as expected due to challenges with scheduling the sessions and that patient charts were not always available at the meeting locations. The team is working on other strategies to provide feedback in a more feasible manner.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is progressing well with data collection and manuscript development. Most aims are on track and budget spending is roughly on target.

**Preliminary Impact and Findings:** Within the two participating ambulatory clinics, a comparison of baseline with one week followup showed that approximately 85 percent are as better by one week as by three weeks. Patient satisfaction surveys showed no significant differences in overall satisfaction between baseline and one week followup. Patients were very positive to the idea of followup and the 46 who reported being called were positive about the actual phone call and had higher overall satisfaction.

Within the ED substudy, the overall rate of dissonance was approximately 10 percent of cases, ranging from 7.7 to 13.8 percent. The ED was the source of the discrepancy in two-thirds of cases, the remainder equally divided between inpatient services and coding errors. There was no evidence for association of dissonance with acuity, as measured by triage class, admitting service, specialty, admission diagnosis, age, race, or gender. There was no evidence for association with ED length of stay, boarding time, or hospital length of stay. There was no evidence of association with resident or attending physician.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
Colorado Associated Community Health Information Exchange

**Principal Investigator:** Davidson, Arthur, M.D. M.S.P.H  
**Organization:** Denver Health and Hospital Authority  
**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)  
**Grant Number:** R18 HS 017205  
**Project Period:** January 2008 – June 2010, Including No-Cost Extension  
**AHRQ Funding Amount:** $986,302  
**Summary Status as of:** June 2010, Completion of Grant

**Target Population:** Chronic Care*, Diabetes, Safety Net

**Summary:** The Colorado Associated Community Health Information Exchange (CACHIE) project designed, developed, and implemented an interoperable quality information system (QIS) for a collaborative network of seven community health centers (CHCs). The system permits real-time, synchronous quality reporting to inform patient care, quality interventions, health policy, and advocacy efforts. The QIS is foundational in nature, ultimately supporting many types of quality and safety analyses. The system compiled data elements from disparate electronic health record (EHR) systems into a common standardized data warehouse and built business intelligence programming to generate meaningful quality measures and reports at the patient, physician, practice, and population levels. The Certification Commission for Health Information Technology-certified pilot EHRs used in this project were NextGen and GE Centricity. An initial goal of the project was to support the development of a custom diabetes template to be integrated into the EHRs. The template content was to be jointly developed to allow the CHCs to document the information necessary to optimize the care of diabetic patients and report on quality processes and outcomes. A template for a second disease or condition was then to be developed based on the CHC needs and the learning experience from the diabetes template.

The project team worked with clinicians to develop consensus on the quality measures that would be required for diabetes and tobacco cessation reporting, along with the specification of those measures. They also gathered ancillary information that allows reports to be actionable for quality improvement. Although some CHC physician leaders had concerns regarding the need for templates in clinical care and the impact of template use on workflow, others were working on template development independent of this project. Due to the fact that the most active sites already had diabetes templates in place, the project did not take on the goal of template development. Baseline reporting and benchmarking, available via the QIS, assisted in identifying and supporting the need for future templates. Clinical reporting allowed providers and practices to “question the data,” a process required to uncover areas where guideline, appropriate care is not uniformly delivered. In circumstances where there was inaccurate or incomplete documentation, data extraction was more difficult or even impossible due to non-standard coding and storage.

The project team worked to establish a replicable process for quality report measurement and actionable report development in other clinical domains, using diabetes as the prototype. Clinicians and technical support staff shared the goals of creating and implementing a standard, efficient process for building
consensus around metrics and their definitions; documenting functional requirements; and sharing the lessons learned from quality improvement initiatives.

The QIS system standardized data using emerging national standard vocabularies. The system supports: 1) identification of best practices; 2) establishment of appropriate CHC benchmarks; 3) development, implementation, and evaluation of targeted quality improvement interventions; 4) use of clinical decision support systems; and 5) promotion of public policies to improve health and health services to low-income populations.

**Specific Aims:**

- Obtain detailed business and technical requirements for development of: 1) a flexible, evidence-based, clinical template system that interoperates with commercially-available EHRs and 2) a timely and efficient quality information reporting system that aggregates and integrates multiple data sources within seven CHCs. *(Achieved)*
- Develop a system for reaching consensus among various CHCs on diabetes quality and actionable report measures. *(Achieved)*
- Extract data from two disparate EHRs, standardize to nationally-recognized vocabularies, and import into a shared data warehouse. *(Achieved)*
- Implement and deploy a business intelligence tool for self-service and static reporting. *(Achieved)*
- Guide, support, and evaluate each CHC practice to build capacity and monitor associated costs as they independently (i.e., without vendor support) implement an evidence-based guideline template. *(Not Achieved)*
- Evaluate the usability, utility, accuracy, and best methods for incorporating quality measure reporting as a feedback mechanism to providers and practice managers. *(Not Achieved)*

**2010 Activities:** The CACHIE project team worked to map and extract the required clinical data from the disparate EHRs, design and build the data warehouse and data marts, and select a business intelligence tool. In addition, the project team engaged with clinician leaders regarding quality measure development and detailed specifications about their implementation. White Cloud Analytics (WCA), a business intelligence firm that has expertise in the building of data cubes to support pre-designed and ad hoc reporting, provided the co-investigator team with an assessment of the database model’s ability to support the desired analytic functions of the QIS. WCA provided report writing training to the CACHIE investigators, so they might better understand the nuances of data cube design to support queries. However, further cube building by WCA was not economically feasible. Standardized quality reporting for diabetes and tobacco cessation were accomplished, along with the creation of patient-tracking reports to supplement the quality reports. Project team meetings with the Colorado Department of Health Care Policy and Finance helped to better define the shared value of combining claims and EHR data for patient tracking and quality reporting.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of June 2010):** At the end of the first quarter in 2010, the status of aims and milestones was reported as on track in some respects, but not others. While a progress report was not submitted at the end of the second quarter, the grantees retrospectively described progress as mostly on track.

**Impact and Findings:** The final report for this project is currently under review. Findings will be disseminated upon approval of the final report.
**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decision making through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

* AHRQ **Priority Population**
Automating Assessment of Asthma Care Quality

Principal Investigator: Hazlehurst, Brian, M.D.
Organization: Kaiser Foundation Research Institute
Mechanism: RFA HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)
Grant Number: R18 HS 017022
Project Period: September 2007 – September 2010, Including No-Cost Extension
AHRQ Funding Amount: $871,711
Summary Status as of: December 2010, Conclusion of Grant

Target Population: Adults, Asthma, Chronic Care*, Pediatric*, Teenagers

Summary: This project aimed to develop, validate, apply, and evaluate a scalable method for routine and comprehensive measurement of outpatient asthma care quality (ACQ). This project leveraged health information technology (IT) to assess and improve quality of care for the insured, indigent, uninsured, and underinsured populations of the Pacific Northwest. To accomplish this task, the project employed MediClass (a medical classifier), which is a proven natural language processing technology for extracting care quality data from both coded data and free-text clinical notes in the electronic medical record (EMR). The project performed retrospective analysis of EMR data from two distinct health systems: a mid-sized health maintenance organization, Kaiser Permanente Northwest (KPNW); and a consortium of federally qualified health center clinics for whom an EMR is delivered and managed by one member organization, Our Community Health Information Networks (OCHIN, Inc.). Data was extracted from Kaiser Permanente’s Certification Commission for Health Information Technology-certified Epic-based EMR, HealthConnect; and OCHIN’s Epic-based EMR, EpicCare. Since these EMR applications reside in separate health systems, the implementation of the products generated differences in the data that were accommodated when these data were interpreted for quality assessments. This project leveraged MediClass to implement methods for collecting and transforming data into common formats for quality assessment across multiple data capture, representation, and storage processes.

The starting study participants included patients older than 12 years who were identified to have asthma by a single visit diagnosis code. Subsequently, a modified Healthcare Effectiveness Data and Information Set method that included text processing of clinician notes was applied in order to qualify patients with persistent asthma for inclusion in assessments of care delivered. The study population was drawn from approximately 24 months of OCHIN data and about 120 months of KPNW data.

Most quality measures were associated with several unique target concepts identified by MediClass processing and validation of these “target concepts” was based on chart reviews at the encounter level. Validation of the ACQ measures was based on chart reviews at the patient level. Sensitivity, specificity, false positive and negative rates, and 95-percent confidence intervals (CIs) were computed for each measure based on the review of 900 patient charts. After the automated measurement method was refined and applied to the target population for each quality measure, the proportions and 95-percent CIs were computed for patients receiving the indicated care measures. In addition, patient-level summary ACQ scores were analyzed. These measures were reported on the entire target population and by age, severity,
and health care system subgroups. The availability of several years of EMR data at KPNW enabled the project to evaluate the relationship of the automated ACQ measures with health outcomes. Logistic regression was employed to model the association between the automated ACQ summary score and the primary outcome measure.

**Specific Aims:**

- Refine ACQ measures from the RAND Quality Assessment Tools Project for use as a quality measure set to evaluate ambulatory asthma care performance. *(Achieved)*
- Develop and validate an automated (generalizable and scalable) method for applying the above care quality measures using comprehensive EMR data. *(Achieved)*
- Apply the automated method developed above to assess ambulatory ACQ in two distinct health plans representing diverse patient populations and care practices. *(Achieved)*
- Evaluate the association between automated measures of adherence to recommended asthma care processes and measures of clinical outcomes using KPNW data only. *(Achieved)*

**2010 Activities:** The process for development and refinement of the ACQ measure set was completed. Subsequently the study team obtained the necessary data components including access to medical records onsite at OCHIN to review medical records and the technology used to process medical records, both text and coded fields; and a limited data set from the EMR was shared with the KPNW Center for Health Research. The study team pulled and formulated data for outcomes in the immediate years following the end of the measurement period in KPNW. They also included a pull of these same data in the year prior to qualification for the ACQ measures to correct outcomes analysis for patient baseline severity. Data were analyzed and incorporated into the project final report.

An extensive chart review of stratified random samples of persistent asthma patients and exacerbation events at each site was completed. The chart review process involved a sample of roughly 450 patients at each site. Chart reviews were utilized to collect the data necessary to evaluate criteria for assessing performance on each quality measure. A 10 percent quality assurance sample was conducted to provide secondary review and to resolve discrepancies.

The measurement method utilized a three-year observation period beginning in 2001 at KPNW only. The study staff also pulled KPNW data for a second three-year observation period beginning in 2006. This second data pull provided an observation period that was contemporaneous with the OCHIN data used and allowed comparisons of measurements across the two health systems.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of September 2010):** As the project came to a close, the primary focus was on the analysis of data and development of manuscripts. The project was able to meet all of its aims and project spending was roughly on target.

**Impact and Findings:** Most ACQ measures performed well in the KPNW system. Overall accuracy, as measured by chart review, ranged from 63 percent to 100 percent and averaged 88 percent across all measures. Sensitivity was 60 percent or greater for 16 of the 18 implemented measures. Fifteen measures had specificity of 60 percent or higher. There were two measures for which specificity was over 90 percent but which had poor sensitivity.

Overall, the automated ACQ measures did not perform as well in the OCHIN system as they did in the KPNW system. Mean overall accuracy was 85 percent and ranged from 72 to 99 percent. Among the 11 routine care measures, eight had specificities over 80 percent and five had sensitivities over 80 percent.
Three measures had specificities of 50 percent or lower while another five had sensitivities of 50 percent or lower. Of the seven exacerbation-related measures, five were evaluable at OCHIN and had a mean overall accuracy of 70 percent with a range of 36 to 96 percent. Sensitivity tended to be relatively low, ranging from 5.3 to 58.1 percent, while specificities were generally high, with a minimum of 67 percent with four measures greater than 90 percent.

Potential explanations for the discrepancy in performance of the automated measures between OCHIN and KPNW include the possibility that chart reviewers may have had differential access to sections of the medical record retrieved by the automated method across sites, and that there may be much greater variability in how and where OCHIN providers document visits for many of the text-based measures. Additional effort may be needed in the specifications of the automated method to capture variations across sites.

Based on chart review results, delivery of routine non-exacerbation care is similar between the two sites. Of these measures, both organizations performed well (better than 90 percent) in providing prescriptions for beta-2 agonists and assuring that their persistent asthma patients were not taking non-cardioselective beta-blockers. Providers in both organizations performed moderately well (60 to 80 percent) in providing anti-inflammatory controllers and querying patients about tobacco use. Flu vaccination was documented in about 40 percent of patients. The remaining measures were only present between 10 to 30 percent of the time.

Among the exacerbation-related care measures there was similar agreement across sites in the chart review results. Both organizations performed well on the review of current medications and the performance of a chest exam. Performance was poor on the remaining exacerbation-related measures.

The study staff also compared prevalences of the ACQ recommended care as determined by the automated method and by chart review. At KPNW they found generally good agreement between the two methods with a few exceptions. Among the exacerbation-related measures, chart reviewers found more chest exams and current medications reviews while the automated method found more evidence for 4-week followup contacts post hospital discharge. Data for the theophylline measure was too sparse to evaluate adequately. Only six measures were performed 80 percent or more of the time according to either the chart review or the automated method. These results confirm that there are significant gaps between recommended care and real world practice.

A similar analysis was performed comparing chart-review prevalences with those of the automated method at the OCHIN site for each care measure. Among the routine non-exacerbation care measures, chart reviewers found more evidence of flu vaccinations and metered dose inhaler instructions while the automated system detected more instances of smoking status queries and tobacco counseling or referral. Among the measurements of exacerbation-related care, prevalences were higher based on chart review for all measures except the theophylline lab measure, for which the data were too sparse to evaluate. Care gaps in the OCHIN system appear to be very similar to those in the KPNW system, with only five measures performing 80 percent or more of the time according to either the chart review or the automated system.

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
## Developing and Using Valid Clinical Quality Metrics for Health Information Technology with Health Information Exchange

**Principal Investigator:** Kaushal, Rainu, M.D.  
**Organization:** Joan and Sanford I. Weill Medical College of Cornell University  
**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)  
**Grant Number:** R18 HS 017067  
**Project Period:** September 2007 – March 2011, Including No-Cost Extension  
**AHRQ Funding Amount:** $974,545  
**Summary Status as of:** December 2010

**Target Population:** Not Applicable

**Summary:** Recently proposed metrics for measuring quality of care in ambulatory settings have been largely designed to measure ambulatory care in isolation, independent of interactions with other health care providers and settings. Innovations in health care driven by the implementation of health information technology (IT) with health information exchange (HIE) require revised sets of quality metrics to assess the impact these interventions promise. For example, new metrics are needed to capture the effects of data sharing between generalists and specialists in the ambulatory setting, and sharing data across transitions between inpatient and outpatient settings. Further, new quality metrics are needed to capitalize on the rich clinical data that could be extracted from electronic health records (EHRs) and other electronic sources.

This project derived a set of quality metrics, built on existing and additional metrics, that capture the effects of health IT with HIE and can be retrieved electronically. This process was accomplished through the contributions of the Health Information Technology Evaluation Collaborative (a multi-institutional academic collaborative established to evaluate health IT and HIE initiatives in New York State), the New York State Department of Health, and four regional health information organizations (RHIOs) that are implementing health IT with HIE and focused on the ambulatory setting. Once derived, this quality metric set was presented to two groups for validation: a panel of national experts in quality measurement and the New York eHealth Collaborative, a multi-stakeholder organization dedicated to advancing health care performance measurement as supported by health IT. The metric set was then refined with the expert panel.

Dr. Kaushal’s team will test the accuracy of electronic retrieval of the data for the metric set, as compared to the gold standard of manual chart review. The metric set will then be used to evaluate the effects on quality of using health IT with HIE, specifically EHRs and electronic portals. To do so, Dr. Kaushal’s team will prospectively follow a randomly selected sample of physicians in ambulatory practices to determine if quality improves over 1 year of using health IT with HIE. This work has the potential to move closer toward capitalizing on the promise of health IT and HIE for improving quality measurement. If validated and effective, the metrics developed and interventions studied could also be disseminated widely to other ambulatory care communities.
Specific Aims:

- Develop a modified set of quality metrics that can be retrieved electronically and is sensitive to the types of improvements in quality that health IT with HIE may contribute in an ambulatory care setting. (Achieved)
- Validate the modified quality metric set. (Achieved)
- Test the reliability of electronic retrieval of the modified quality metric set. (Ongoing)
- Use the modified quality metric set to evaluate the long-term effects of using health IT with HIE on improving health care quality. (Ongoing)

2010 Activities: The project team focused on testing the reliability of electronic reporting. The identification of a collaborating partner was initially delayed because most vendors could not electronically report on the metrics. Dr. Kaushal is now working with a network of community health centers (CHCs) in New York. These CHCs are using a commercial EHR and have customized the EHR so that it is able to facilitate quality reporting. The project team developed a methodology for reporting on the metrics, which was reviewed by the Institutional Review Board. Additionally, the team refined data collection instruments, as all of the existing tools were designed for manual chart review, not electronic abstraction. Dr. Kaushal also worked with an experienced programmer to develop automated queries from the EHR to obtain the quality indicators of interest. The data captured by these electronic queries will be compared to manually extracted data. All of these efforts are part of the quality assurance (QA) effort to test the accuracy of the data entered and maintained in the EHR. QA will be followed by analysis and manuscript preparation.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The team is now mostly on track to complete the study and to expend all funds during a no-cost extension period. The project is meeting the revised time line and spending is roughly on target.

Preliminary Impact and Findings: National discussions about interoperability of EHR focus on the definition of meaningful use. These discussions, however, assume that providers will be able to report meaningful use metrics from their EHR. The metrics developed for this study, which are similar to potential meaningful use metrics, could not be easily reported by most vendor EHRs. This observation highlights larger policy ramifications as community providers strive to demonstrate meaningful use.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Electronic Support for Public Health–Vaccine Adverse Event Reporting System

Organization: Harvard Pilgrim Health Care, Inc.
Mechanism: RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)
Grant Number: R18 HS 017045
Project Period: December 2007 – September 2010, Including No-Cost Extension
AHRQ Funding Amount: $999,995
Summary Status as of: September 2010, Completion of Grant

Target Population: General

Summary: Public and professional confidence in vaccination depends on reliable postmarketing surveillance systems to ensure that rare and unexpected adverse effects are rapidly identified. The goal of this project was to improve the quality of vaccination programs by improving the quality of physician adverse vaccine event detection and reporting to the National Vaccine Adverse Event Reporting System (VAERS). This project served as an extension of the Electronic Support for Public Health (ESP) project, an automated system using electronic medical record (EMR) data to detect and securely report cases of statutory notifiable diseases to a local public health authority. ESP provides a ready-made platform for automatically converting clinical, laboratory, prescription, and demographic data from almost any EMR system into database tables on a completely independent server. The ESP:VAERS project specifically developed criteria and algorithms to identify important adverse events related to vaccinations in ambulatory care EMR data, and format and securely send electronic VAERS reports directly to the Centers for Disease Control and Prevention (CDC).

Patient data are available from Epic System’s Certification Commission for Health Information Technology-certified EpicCare EMR system at all ambulatory care encounters within Atrius Health, a large multispecialty group practice with over 35 facilities. Every patient receiving a vaccine is automatically identified, and for the next 30 days their health care diagnostic codes, laboratory tests, and medication prescriptions are evaluated for values suggestive of an adverse vaccine event. When a possible adverse event is detected, it is recorded and the appropriate clinician is notified electronically.

Clinicians are able to preview a pre-populated report with information from the EMR about the patient, including vaccine type, lot number, and possible adverse effect, to inform their clinical judgment regarding whether they wish to send a report to VAERS. Clinicians have the option of adding free-text comments to pre-populated VAERS reports or to document their decision not to send a report. The CDC’s Public Health Information Network Messaging System (PHIN-MS) software has been installed within the facilities so that the approved reports are securely transferred to VAERS as electronic messages in an interoperable health data exchange format using Health Level 7 (HL7).

Specific Aims:

- Identify required data elements, and develop systems to monitor ambulatory care EMRs for adverse events following vaccine administration. (Achieved)
• Prepare and securely submit clinician-approved electronic reports to the national VAERS. (Achieved)
• Comprehensively evaluate ESP:VAERS performance in a randomized trial and in comparison to existing VAERS and Vaccine Safety Datalink data. (Not Achieved)
• Distribute documentation and application software developed and refined in the first two aims listed above that are portable to other ambulatory care settings and to other EMR systems. (Achieved)

2010 Activities: During this no-cost extension year, the majority of effort was to build on the work completed in the first year, in which criteria were developed consultatively to implement, validate, and test adverse event definitions identifying case histories that might be suggestive of an adverse effect following vaccination. The grant team has a functioning adverse event detection system capable of being expanded and modified to deal with a wide range of conditions. Testing and initial validation are complete. Additional validation was planned as part of dissemination to other sites.

Functioning source code is now available to share under an approved open source license. Dr. Lazarus has added the ESP:VAERS code, HL7, and other specifications and documentation to the existing ESP Web documentation and distribution resource center (http://esphealth.org). The existing Web site served as the prototype as planned. The ESP:VAERS case-management Web site has been completed.

Software and identification keys were obtained from the CDC in order to complete PHIN-MS installation on a test server for testing, and secure message transport to the target server has been successfully tested.

The HL7 specification describing the elements for an electronic message to the consultants engaged by CDC for this project has been implemented. Synthetic and real test data have been generated and successfully transmitted between Harvard Pilgrim Health Care and the consultant group.

The team had planned to evaluate the system by comparing their adverse event findings to those in the Vaccine Safety Datalink project—a collaborative effort between CDC’s Immunization Safety Office and eight large managed care organizations. Through a randomized trial, the team had also planned to test the hypothesis that the combination of secure, computer-assisted, clinician-approved, adverse event detection, and automated electronic reporting will substantially increase the number, completeness, validity, and timeliness of physician-approved case reports to VAERS compared to the existing spontaneous reporting system. However, due to restructuring at CDC and consequent delays in terms of decisionmaking, it was ultimately not possible to move forward with discussions regarding the evaluation of ESP:VAERS performance in a randomized trial, or to compare ESP:VAERS performance to existing VAERS and Vaccine Safety Datalink data, as was described in the third aim. However, the infrastructure is available and Dr. Lazarus is hopeful that the project may generate additional interest to complete this study.

A critical part of many public health functions is to be able to send information back to physicians in a way that is quick and cost effective. The team was able to successfully develop a system which sent a message to physicians in a way that was integrated into the EMR as part of their regular work routine, and that they did not find intrusive.

Grantee’s Most Recent Self-Reported Quarterly Status (as of September 2010): The randomized trial was not achieved, as described above. However, all other aims and milestones were successfully achieved. Budget spending was on target.

Impact and Findings: It is possible to automatically detect adverse events in defined ways, and to electronically report them to CDC’s VAERS. Decision support functions can be repurposed such that
instead of detecting reportable diseases, they can detect events that are related to vaccination, as potential vaccine adverse events.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Medication Monitoring for Vulnerable Populations via Information Technology

**Principal Investigator:** Lehmann, Christoph, M.D.  
**Organization:** Johns Hopkins University  
**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)  
**Grant Number:** R18 HS 017018  
**Project Period:** September 2007 – August 2010, Including No-Cost Extension  
**AHRQ Funding Amount:** $994,325  
**Summary Status as of:** August 2010, Conclusion of Grant

**Target Population:** Adults, Chronic Care*, Diabetes, Heart Disease, Lung Disease

**Summary:** The Institute of Medicine report, Preventing Medication Errors, offered some of the first broad insights into the risk of medication errors in ambulatory settings. Quality lapses and errors related to medications are some of the most prevalent risks across all care settings, and morbidity due to these errors is costly. Medication monitoring is the least-well understood phase of medication use as it pertains to quality and safety, especially in the ambulatory setting. Available data highlights significant potential for patient safety improvement by increasing rates of medication therapeutic monitoring. It is not known how to best identify patients in need of medication therapeutic monitoring in the ambulatory setting, but the use of electronic health records (EHRs) is promising. It is also not known, given the lack of national guidelines on laboratory monitoring, if providers fully understand how to link the process of therapeutic monitoring to differences in patient outcomes.

The overall goal of this project was a practice-based, cross-sectional demonstration of the ability of interoperable health information exchange and a Certification Commission for Health Information Technology-certified EHR to provide useful quality and safety measures for the vulnerable populations served by two Baltimore Medical System (BMS) Community Health Center (CHC) clinics. The quality and safety measures evaluated were developed for ambulatory care by the National Committee for Quality Assurance, supported by the National Quality Forum, and focused on safety monitoring for chronic medications commonly used by patients with heart disease and diabetes mellitus. The project’s intervention included a monitoring bulletin provided to physicians every 2 months to inform them of patients who required therapeutic monitoring tests for one or more of the quality measures. The project also evaluated the relationship between contextual factors (teamwork and safety climate at BMS) and provider assessments of EHR quality and safety data as useful and actionable, and whether deployment of EHR quality and safety measurement efforts improved clinics’ teamwork and safety climate.

An automated query that used the BMS EHR to find eligible patients for the measures was developed. Data to fulfill the measures were collected by a newly-developed, bidirectional interface and patient laboratory history back-loading capability between Johns Hopkins’ Pathology Data Systems Department and the BMS EHRs.
Specific Aims:

- Develop and implement accurate quality and safety measures using EHRs that focus on medication monitoring for vulnerable BMS CHC populations. Explore factors that influence accuracy of EHR-derived measures. *(Achieved)*

- Develop and implement EHR-based quality and safety measures of medication monitoring for vulnerable BMS CHC populations that are useful to clinicians and senior leaders. *(Achieved)*

- Develop and implement EHR-based quality and safety measures of medication monitoring for vulnerable BMS CHC populations that impact patient outcomes. *(Achieved)*

- Evaluate the relationship between contextual factors (teamwork and safety climate at BMS) and provider assessments of EHR quality and safety data as useful and actionable, and evaluate whether deployment of these measurement efforts will improve teamwork and safety climate at CHC. *(Achieved)*

2010 Activities: The primary project activities for this period included analysis of qualitative and quantitative data and the preparation of manuscripts.

Grantee’s Most Recent Self-Reported Quarterly Status (as of August 2010): The project was completed and all major aims achieved.

Preliminary Impact and Findings: The project found that automatic queries of EHRs to identify patients eligible for quality measures are feasible and potentially far superior to manual reviews of EHR data. Complex eligibility rules for quality measures may limit the usefulness of human EHR reviewers. The instrument that measures providers’ feelings about the usefulness of the feedback bulletin may be able to measure provider responses to other quality improvement or practice management interventions. However, the instrument needs to be tested in larger samples.

The study was not able to delineate the reasons why a subset of patients does not reliably receive timely medication monitoring, but there are likely many reasons, including patient-, provider-, and system-related factors. Patient-related factors may include aversion to needle sticks, cost, or logistical barriers. Patients also may not perceive chronic medication use as risky, or assume that they would seek care if and when they developed toxicity symptoms. Provider-related factors may include a lack of awareness that medication monitoring is indicated, or skepticism about the value of medication monitoring. System-related factors may include technological inadequacies that make identification of patients in need of screening difficult or impossible. Many clinical settings do not have a fully-integrated pharmacy, laboratory, or clinical data system, which are prerequisites for approaching medication monitoring in an effective way.

Safety culture was assessed in these clinics and the staff reported that the results accurately represented their views of what it is like to work in the clinics. This study did not corroborate findings from earlier studies, which indicated that interventions to improve care quality are associated with improvements in safety culture.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Synthesis and Dissemination
Improving Quality in Cancer Screening: The Excellence Report for Colonoscopy

Principal Investigator: Logan, Judith, M.D.
Organization: Oregon Health and Science University
Mechanism: RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)
Grant Number: R18 HS 017017
Project Period: August 2007 – August 2010, Including No-Cost Extension
AHRQ Funding Amount: $616,207
Summary Status as of: August 2010, Conclusion of Grant

Target Population: Adults, Cancer

Summary: Colorectal cancer is the second leading cause of cancer-related deaths in the United States. Colonoscopy is used increasingly for primary screening and to evaluate positive screening tests, but the effectiveness of colonoscopy depends on providing high-quality examinations with few complications. This initiative is designed to evaluate and improve the quality of screening and diagnostic colonoscopies in ambulatory care settings by presenting the Excellence Report, a quality report card to clinicians.

Using the Clinical Outcomes Research Initiative (CORI) software application and the National Endoscopic Database, the project developed and tested the Excellence Report. The Excellence Report is a quality report card for gastrointestinal (GI) endoscopy that focuses on nationally recognized quality process measures for colonoscopy. Using a clustered-randomized trial design, the project staff sent CORI-affiliated clinicians working in ambulatory care centers or offices monthly reports of their quality measures through a secure Web site along with comparisons to other CORI clinicians and national benchmarks. The effects of reporting quality measures data, adherence to quality recommendations, and durability of changes upon discontinuing the reports, were measured. Concurrently, field observations and interviews were performed with a representative sample of clinicians receiving the Excellence Report. The objectives of these interviews were: to understand clinician perceptions of reliability and validity of the data presented; to understand clinician acceptance of the quality initiative; and to look for effects on workflow and any unintended consequences of the Excellence Report. In addition, this project, along with GI specialty societies, coordinated a series of four Webinars with representatives from GI reporting software vendors, imaging system vendors, and GI pathology laboratories. The Webinars provided information on the development of a sustainable and standards-based architecture that will allow the Excellence Report to expand beyond CORI.

Specific Aims:
• Create the Excellence Report, a quality report card of individual performance on quality measures, and present this as monthly feedback to the ambulatory care providers of CORI. (Achieved)
• Measure the effect of the Excellence Report on individual performance in adherence to the recommended quality measures for colonoscopy. (Achieved)
• Perform a qualitative assessment of the effect of the Excellence Report on providers, study the
acceptance of the individual Excellence Report and effects on workflow, and identify any unintended consequences. (Achieved)

• Lead an industry consortium comprised of endoscopy reporting software vendors, pathology laboratories, and endoscopy imaging vendors to develop industry-wide standards for the exchange of data on colonoscopy quality measures. (Achieved)

**2010 Activities:** The primary focus for study staff during this period was the completion of data analysis and the development of manuscripts for submission to peer review journals.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of August 2010):** The project is complete with all major aims achieved and project spending on target.

**Impact and Findings:** Overall changes in compliance with all quality measures were small, and the direction of change for each quality measure was not always towards improvement. All measures depend upon adequate documentation and there is a wide variation between endoscopists in their rate of documentation. American Society of Anesthesiologist classification, for example, was documented from 0 to 100 percent of the time in both intervention and control groups. If endoscopists who documented 0 percent of the time are excluded, however, a value is documented an average of 93 percent of the time. It is possible that those clinicians who did not document in CORI are collecting this information in other documentation, such as in a separate anesthesia record. This same variability in completeness of documentation was seen with all measures.

Analysis of significance of changes was performed in two measures, chosen because of their significance in quality patient care. For these two measures a general linear mixed model (GLMM) was used to test for differences in the quality measures pre- and post-intervention between control and intervention groups. The data consisted of summary data (proportion of exams that met the quality measure) on a per endoscopist level. The GLMM method allowed researchers to investigate a nested structure – communities within each treatment arm and then providers within communities (and two time points for providers). This allowed control for potential correlation between observations from the same community and additional correlation between observations from the same provider. As part of the analysis, the project team also tested the difference between pre- and post-intervention depending on treatment arm. For both models, community and the interaction between pre- and post-intervention arms (examining if pre- vs. post-intervention differences depended on treatment arm) were not found to be significant and did not remain in the final models.

The qualitative study revealed six themes: workflow, organizational structure and accreditation, temporal issues, integration issues, value of measures and reports, and the need for data of high quality. Each theme is discussed below:

**Workflow.** Staff members at each of the five sites designed clinic workflow for colonoscopy procedures somewhat differently, but there were many similarities in how and when clinicians used CORI. The second aspect to workflow was accessing the Excellence Reports. The clinicians who had looked at the reports felt that they might access the reports if they were either a novice or if they were trying to improve their ratings on a particular measure. Most physicians felt that monthly access is too frequent and quarterly might be more useful. They felt that sending the reports to clinic managers might be more useful than requiring access by physicians.
Organizational Structure and Accreditation. There was great variation between a small clinic without Ambulatory Surgery Center (ASC) accreditation and the larger clinics that were accredited. The sites with ASC accreditation tended to be more motivated to measure quality because of certification requirements. In addition, some specialty board recertification for the GI physicians required quality measurement which may have influenced physician willingness to measure quality.

Temporal Issues. Clinicians are concerned about administrative burden to such an extent that, when asked what they thought about pay for performance incentives, they always expressed doubt that the incentive offered would be worth the additional manpower needed for reporting. Temporal issues also arose when physicians discussed measures they would most like. For instance, gastroenterologists would like to see a measurement around adenoma counts which require additional data entry post-procedure once the final pathology report is received. Only one site was entering such after-the-procedure information.

Integration Issues. More complete quality measurement could be accomplished if CORI, the different electronic medical records, and the imaging systems could be interoperable. Two sites double enter information into both the electronic medical records and CORI. Most use separate imaging systems, though one can import the images into CORI. At one site, the GI physicians have an ambulatory clinic using CORI and also practice at a hospital next door that uses CORI; however, the data in the two CORI systems are not integrated.

Value of Measures and Reports. Staff members at the sites that have designated quality assurance physicians and Accreditation Association for Ambulatory Health Care accreditation seem highly motivated and even excited about the Excellence Reports and measurement in general. Systems need to be designed so that the data entry burden is not large. Many noted that insurance companies now want to see outcomes data. In addition, several interviewees reported that patients are starting to ask how the clinicians rate on some measures.

The Need for Data of High Quality. The measures that come out of the system and that can be reported on are only as good as the data that enter the system.

In addition, differing viewpoints were detected which are described below:

Specialists and Other Providers. At nearly every site, the GI physicians’ view of quality measures is very different from that of general surgeons or family practitioners. The GI physicians are proud to be knowledgeable about the latest evidence and on the forefront of putting this evidence into practice. One point of contention with those who are not specialists is followup protocols. The specialists are confident that quality reports will be in their favor.

Specialists and Hospitals. Another differing view is that of the hospital. There seems to be some competition between hospitals and ambulatory clinics and, as researchers were told, hospitals in some States have lobbied to limit the number of clinics that can be licensed to perform these procedures.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Synthesis and Dissemination
Massachusetts Quality E-Measure Validation Study

Principal Investigator: Schneider, Eric, M.D.
Organization: RAND Corporation
Grant Number: R18 HS 017048
Project Period: September 2007 – August 2011, Including No-Cost Extension
AHRQ Funding Amount: $995,575
Summary Status as of: December 2010

Target Population: Adults
Summary: Although the National Quality Forum has endorsed 26 standardized measures of ambulatory care for national priority conditions, measurement of and reporting on the quality of care delivered by office-based ambulatory care physicians has lagged. The implementation of electronic health records (EHRs) could revolutionize ambulatory quality measurement by increasing the validity of clinical measures and reducing the cost and burden of data collection.

This project is evaluating the readiness of structured EHR data to support ambulatory clinical quality measurement. Using the Ambulatory Care Quality Alliance (AQA) ambulatory care measurement set, the study team is comparing quality measures by applying two standard measurement methods: 1) a “hybrid method,” combining claims data with medical record review; and 2) a “claims-only method,” based upon claims data aggregated across commercial health plans and the Medicare program. The project includes primary analyses with formal hypothesis testing and secondary analyses that will help to identify and prioritize high-impact, short- and long-term modifications to community-wide, office-based EHR systems that could support and accelerate the dissemination of ambulatory clinical quality measurement. The data used for this grant are being collected and aggregated as part of the Massachusetts eHealth Collaborative’s (MAeHC’s) community-wide interoperable EHR implementation pilot in two Massachusetts communities. Massachusetts Health Quality Partners is developing EHR-based quality measure specifications and data extraction logic for the AQA ambulatory quality measure set. In addition to the implementation of interoperable EHRs, the Quality and Usage Data Coordinating Center was developed and implemented for selective retrieval, linkage, and storage of patient-level clinical data elements that can be used to calculate clinical quality measure results. The project is using the eClinicalWorks EHR, a Certification Commission for Health Information Technology-certified product.

Specific Aims:
• Recruit a cohort of adult ambulatory patients from two communities that are piloting community-wide implementation of structured EHRs to compare a quality measurement method based on a structured EHR data to a hybrid method involving a combination of aggregated claims data and medical record review. (Ongoing)
• Compare a measurement method based on structured EHR data to a claims-only method based on a novel database that aggregates claims data from commercial health plans and Medicare. (Ongoing)
2010 Activities: The principal investigator transitioned from the Harvard School of Public Health to RAND Corporation. This transition required RAND institutional review board (IRB) approval, including a data safeguarding plan. The project received final approval from the RAND IRB and expects to proceed with fieldwork as scheduled. Additionally, project staff began coordinating with MAeHC and the pilot communities to contact eligible physicians.

Patient recruitment materials were developed and include a letter to physicians notifying them of the study and to give them the opportunity to opt any of their patients out as necessary; a pre-notification letter inviting patients to participate in the research study, which will be sent with an opt-out form; a formal invitation letter that will be sent with the study consent form and a copy of the survey questionnaire; and a study reminder letter for participating patients.

Data-use agreements were finalized and executed with the two participating health plans. Sample data for the first aim was transferred from the health plans to project staff and was verified, while the measure specifications, which were referred to in the first aim, were defined. For measures in the AQA ambulatory care measurement set, the team will recruit a cohort of adult ambulatory patients from three communities that are piloting community-wide implementation of structured EHRs to compare a quality measurement method based on structured EHR data, to a hybrid method that involves a combination of aggregated claims data and medical record review.

Adults between 18 and 80 years-of-age who are eligible for at least one of the measures (breast-, colorectal, or cervical-cancer screening, influenza or pneumonia vaccination, or tobacco use) will be included. The population eligible for inclusion in these measures will also contain individuals eligible for the other study measures.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is on track, meeting most aims on time and project spending is roughly on target.

Preliminary Impact and Findings: The project does not have any findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Feedback of Treatment Intensification Data to Reduce Cardiovascular Disease Risk

Principal Investigator: Selby, Joseph, M.D.
Organization: Kaiser Foundation Research Institute
Grant Number: R18 HS 017031
Project Period: November 2007 – August 2010, Including No-Cost Extension
AHRQ Funding Amount: $997,069
Summary Status as of: August 2010, Conclusion of Grant

Target Population: Adults, Chronic Care*, Diabetes, Heart Disease

Summary: Despite the availability of highly effective medications for controlling the major cardiovascular disease (CVD) risk factors, many patients, including many at high risk for developing CVD, continue to be in poor control of systolic blood pressure (SBP), low-density lipoprotein cholesterol (LDL-c), and glycosylated hemoglobin (hemoglobin A1c). Evidence indicates that clinician failure to prescribe recommended increases in the intensity of medication regimens is frequently associated with poor control of these outcomes. Treatment intensification, the frequency with which clinicians appropriately increase pharmacotherapy in the face of poor control, has been proposed as a new measure of clinical quality. The linkage of process measures, such as treatment intensification to clinical benefit, is often supported by strong clinical trial evidence. Such measures could also be more useful than reports of risk-factor control because the actions needed to improve control are implicit in the measures and because concerns about case-mix differences are largely avoided. However, there is little empirical evidence that reporting and improving these process measures can lead to better outcomes.

The Intensification Feedback and Outcomes Study worked with eight primary care facilities of Kaiser Permanente Northern California to assess whether the use of systematic feedback on the need for treatment intensification in patients with poor control of CVD risk factors improves risk-factor control. Using a cluster randomized trial design, this project leveraged health information technology, including Kaiser Permanente’s Certification Commission for Health Information Technology-certified Epic-based electronic medical record (EMR) HealthConnect and the population management software tool used for the Preventing Heart Attacks and Strokes Everyday (PHASE) program, to create and deliver this need for treatment intensification information to providers who have high CVD-risk patients. At intervention facilities, patient-level information was obtained from the EMR on the need for treatment intensification for SBP, LDL-c, and hemoglobin A1c, as well as recent medication adherence. This information was added to the PHASE population management database and fed back through software currently used by the PHASE staff working with primary care providers. Staff at control facilities continued to use the PHASE population management database and the same software but received information only on risk-factor levels and selected medications.

The proposed feedback intervention was tested for 6 months. The study population for primary analyses included all PHASE patients who were found to have had poor control of two or more of the CVD risk
factors and a need for treatment intensification at any point during the 6-month period. One primary analysis was tightly-linked processes (i.e., was treatment intensified more frequently) measured during the 3 months following initial reporting of need for intensification. Another endpoint was mean levels of intermediate outcomes (SBP, LDL-c, and A1c) measured for all study population subjects during a 9-month period that began 3 months after the end of the intervention. Secondary endpoints included proportions in control for each risk factor; treatment intensification and risk-factor improvements in patient subgroups defined by prior adherence to prescribed medications; efficiency of the intervention in terms of patient contacts, visits, and costs per unit improvement in risk-factor control; and provider reports of the utility and efficiency of the treatment intensification feedback. Positive findings point the way for other health information technology systems to achieve an effective means of lowering the occurrence of CVD and also serve to validate treatment intensification as a new process-of-care quality metric.

Specific Aims:

• Evaluate the effectiveness of measuring and reporting information on the need for treatment intensification in patients at high risk for CVD to improve rates of treatment intensification and to reduce levels of poorly controlled SBP, LDL-c, and A1c. (Achieved)

• Evaluate the impact of the intervention, compared to current population management practice, on total numbers of patient contacts, outpatient visits, and costs of care in relation to improvements in risk factor control. (Achieved)

• Evaluate the effect of the intervention on physician and staff perceptions of the value (effectiveness and efficiency) of the population management program for high risk patients. (Achieved)

2010 Activities: The study team primarily focused on data collection and analysis during this timeframe. Manuscripts were developed and published.

Grantee’s Most Recent Self-Reported Quarterly Status (as of August 2010): The project was completed with all major aims achieved.

Impact and Findings: While adjusted treatment intensification rates for patients with elevated SBP and LDL-c levels differed somewhat in favor of the intervention facilities, proportions of patients who were in control of risk-factor values were similar (or slightly favored the control sites) at the end of the followup period. Because the intervention overall had minimal impact on outcomes, a full cost-benefit analysis of the intervention was not undertaken. The qualitative assessment of the intervention showed that facilities would be more willing to use this type of information in population outreach, and that their use would be more effective, if treatment intensification flags were created in a more timely fashion and if patient-level adherence data were also provided.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve healthcare decisionmaking through the use of integrated data and knowledge management.

Business Goal: Synthesis and Dissemination

* AHRQ Priority Population
# Using Electronic Records to Detect and Learn From Ambulatory Diagnostic Errors

**Principal Investigator:** Thomas, Eric, M.D.  
**Organization:** University of Texas Health Science Center Houston  
**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)  
**Grant Number:** R18 HS 017244  
**Project Period:** November 2007 – September 2010, Including No-Cost Extension  
**AHRQ Funding Amount:** $873,108  
**Summary Status as of:** September 2010, Completion of Grant

**Target Population:** Adults, Pediatric*  

**Summary:** The project utilized data from electronic health records (EHRs) from a Veterans Affairs (VA) and a non-VA primary care network to detect diagnostic errors and understand their causes. It lays the groundwork for future prevention strategies.

The project evaluated two methods to detect diagnostic errors. The first method applied a trigger algorithm to the EHR to detect patterns of visits that could have been precipitated by diagnostic errors. Manual chart reviews of the electronic records were conducted to verify the presence of diagnostic errors. The project tested the triggers by comparing their positive predictive values (PPV) with a random sample of visits that did not meet the trigger criteria. To improve the triggers, a logistics regression model was used to test the additive PPV of integrating the trigger with specific independent clinical variables such as vital signs, laboratory values, or radiology data. A second study used the alert management software of the Veterans Affairs Medical Center (VAMC) to track and identify cases where care providers did not electronically acknowledge pre-specified abnormal test results. Manual chart reviews of the electronic records were performed to determine the presence or absence of diagnostic errors related to test result followup.

The data for this project was collected from the VAMC’s Veterans Health Information Systems and Technology Architecture (VistA) data repository and the repository of a home-grown integrated non-VA EHR for the non-VA site. The repositories contained all clinical data pertaining to patient care, including physician notes, laboratory and radiology reports, and other electronic data. Both repositories are periodically updated.

**Specific Aims:**

- Apply and improve computerized triggers based on visit patterns to detect, measure, and learn from diagnostic errors in diverse primary care settings. *(Achieved)*
- Test whether a method of computerized tracking for abnormal test results that are potentially lost to followup can be used as a trigger to identify diagnostic near-misses in primary care. *(Achieved)*

**2010 Activities:** In 2010, chart reviews were completed for both Trigger 1 and Trigger 2 at the two sites. Trigger 1 is a primary care visit (index visit) with hospitalization in the next 14 days. Trigger 2 is an index visit followed by one or more primary care visits, an urgent care visit, or an emergency department visit.
within 14 days, but excludes index visits that were detected by Trigger 1. The project team decided to increase the sample size, which improved the analytic ability but lengthened the data collection period, especially given constraints of chart reviewers.

Grantee’s Most Recent Self-Reported Quarterly Status (as of September 2010): The project accomplished all project aims during the no-cost extension phase within the proposed budget.

Impact and Findings: The project published articles in two journals. The first, published in the Archives of Internal Medicine, “Timely follow-up of abnormal diagnostic imaging test results in an outpatient setting: are electronic medical records achieving their potential?”, describes the challenges, even within an integrated EHR system to the timely followup of abnormal diagnostic imaging results. The second was published in the American Journal of Medicine, “Notification of abnormal lab test results in an electronic medical record: do any safety concerns remain?”, and describes the types of outpatient errors in abnormal lab result followup that remain even with an EHR system. Several other publications are in development, including one intended for the quality-improvement audience, focusing on the positive predictive values of triggers. It will describe how the team improved the triggers in a way that will allow others to build and improve their own triggers. The second paper will discuss clinical errors and the findings related to understanding these errors based on the development of the triggers. For example, it will describe the types of events that lead to clinical errors.

This project successfully developed a trigger that had a higher predictive value than those used in previous studies. A final important finding is that previously, diagnostic error in primary care has focused on cancer. Data from this study however, indicates that there is a range of common conditions in which diagnostic errors occur.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
### Monitoring Intensification of Treatment for Hyperglycemia and Hyperlipidemia

**Principal Investigator:** Turchin, Alexander, M.D.  
**Organization:** Brigham and Women’s Hospital  
**Mechanism:** RFA: HS07-002: Ambulatory and Safety Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)  
**Grant Number:** R18 HS 017030  
**Project Period:** September 2007 – December 2010  
**AHRQ Funding Amount:** $533,431  
**Summary Status as of:** December 2010, Conclusion of Grant

**Target Population:** Adults, Chronic Care*, Diabetes

**Summary:** Diabetes quality-of-care measurement is increasingly used to evaluate quality improvement programs and to compare physicians and health plans. Therefore, it is important to know which measures are best associated with clinical outcomes. The most widely used process measures for diabetes quality-of-care, hemoglobin (HbA1c), and low-density lipoprotein (LDL) screening rates have multiple limitations. This project tested the sensitivity and specificity of new informatics tools on improving diabetes quality-of-care measurement.

Poor control of elevated blood pressure and glycosylated HbA1c have been linked to low frequency of treatment intensification. Treatment intensification is defined as an increase in the total daily dose of any anti-hyperglycemic medication and includes either the initiation of a new medication or an increase in the dose of an existing medication. Dr. Turchin and his team developed a physician performance process measure using both structured and unstructured data on the frequency of treatment intensification in managing hyperglycemia and hyperlipidemia. Two informatics tools were developed to determine, based on data from the patient’s electronic health record (EHR), if treatment medication was increased. The first tool extracts structured data from the EHR. The second is a natural language processing tool that assesses whether accurate measures of treatment intensification can be obtained through computational analysis of unstructured text in physician notes.

This project applied the informatics tools to retrospective data generated from an internally-developed EHR, the Longitudinal Medical Record, which was collected in Partners Healthcare System’s proprietary Research Patient Data Registry. The data collected were based on patient visits to primary care practices affiliated with Massachusetts General Hospital and Brigham and Women’s Hospital. By testing the sensitivity and specificity of the measures in a manual review of the electronic patient records, the project determined if the treatment measures obtained through the informatics tools were clinically valid. This research was done by two independent reviewers who did not participate in the tool development. The project used a variety of statistical analyses to demonstrate a relationship between HbA1c and LDL cholesterol levels and two measures of treatment intensification: frequency of treatment intensification, and time to treatment intensification.
Specific Aims:

- Test the hypothesis that an accurate measure of treatment intensification in the management of hyperglycemia and hyperlipidemia can be obtained through computational analysis of the text of physician notes in the EHR. (Achieved)
- Test the hypothesis that the measure of treatment intensification developed in the first aim is related to glucose and lipid control. (Achieved)
- Identify specific patient and visit characteristics that affect the probability of anti-hyperglycemic and anti-hyperlipidemic treatment intensification at a given visit. (Achieved)
- Test the hypothesis that case mix-adjusted measure of intensification for treating hyperglycemia and hyperlipidemia is more strongly associated with clinical outcomes than currently used process measures of diabetes care. (Achieved)

2010 Activities: Activities focused upon ongoing data analysis and preparation of manuscripts of reported outcomes.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is complete with all major milestones achieved.

Impact and Findings: The team designed high-fidelity natural language processing tools for identification of treatment intensification in narrative text. Analysis established that narrative and structured data sources provide complementary information about treatment intensification. Data confirm that treatment intensification is strongly associated with faster achievement of both HgA1c and LDL control. High HgA1c and LDL levels were associated with higher probability of treatment intensification while government insurance and female gender were associated with lower rates of intensification. Higher treatment intensification rate and higher HgA1c/LDL testing frequency were associated with higher probability of HgA1c control. The software achieved high accuracy of extraction of medication intensification information from narrative text. The team found that narrative and structured records represented complementary data sources, approximately one third of all intensification records were shared between the two sources, while the rest were unique to either one of them.

In univariate analysis, median time to HgA1c normalization gradually decreased from 1,708 days for patients whose anti-hyperglycemic treatment was intensified less than once every 12 months to 147 days for patients whose anti-hypertensive treatment was intensified more than once every 3 months (p < 0.0001). Similarly, median time to LDL cholesterol normalization decreased from 1,408 days for patients whose anti-hyperlipidemic treatment was intensified less than once a year to 89 days for patients whose anti-hyperlipidemic treatment was intensified more than once every 3 months (p < 0.0001). In a multivariable analysis that adjusted for patient age, gender, race, health insurance, median income by zip code, treatment with insulin, initial HgA1c, and frequency of encounters with the primary care physician, an increase in one anti-hyperglycemic treatment intensification per month was associated with a hazard ratio of 44.9 (95 percent confidence interval [CI] 36.3 to 55.6; p < 0.0001) for reaching HgA1c target. Similarly, multivariable analysis adjusted for patient age, gender, race, health insurance, median income by zip code, initial LDL cholesterol level, and frequency of encounters with the primary care physician showed that an increase in one anti-hypercholesterolemic treatment intensification per month was associated with a hazard ratio of 50.2 (95 percent CI 23.1 to 109.4; p < 0.0001) for reaching LDL target.
In multivariable analysis of the factors associated with anti-hyperglycemic treatment intensification for patients with HgA1c ≥ 7.0 percent, the study found that treatment with insulin and higher HgA1c levels were strongly associated with increased probability of intensification while government insurance and female gender were associated with lower probability of intensification. Race and median income by zip code were not significantly associated with anti-hyperglycemic treatment intensification. In multivariable analysis of the factors associated with anti-hyperlipidemic treatment intensification for patients with LDL cholesterol greater than or equal to 100 mg/dL, higher LDL, non-white race, older age, and higher income were strongly associated with increased probability of intensification while having a government insurance, speaking English as the primary language, and female gender were associated with lower probability of intensification.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decision making through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Crossing the Quality Assessment Chasm: Aligning Measured and True Quality of Care

Principal Investigator: Weiner, Mark, M.D.
Organization: University of Pennsylvania
Mechanism: RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement through Health Information Technology (EQM)
Grant Number: R18 HS 017099
Project Period: September 2007 – September 2010, Including No-Cost Extension
AHRQ Funding Amount: $812,237
Summary Status as of: September 2010, Completion of Grant

Target Population: Adults, Chronic Care*, Diabetes

Summary: This study identified and quantified the impact on quality assessments of real-world circumstances at the Philadelphia Veterans Administration Medical Center (PVAMC) and at the University of Pennsylvania Health System’s (UPHS’s) ambulatory practices, where the current cross-sectional measures of quality do not reflect the true quality of care being rendered. The project was able to leverage detailed and discrete data from electronic medical records (EMRs) to develop measures that account for heterogeneity among different diabetic patient panels, credit improvement in the control of diabetes among individuals in a given population over time, recognize provider effort in medical management, and incorporate management of diabetes comorbidities such as high blood pressure and hyperlipidemia.

The project team collected and analyzed data from two different EMRs. The UPHS uses EpicCare Hyperspace, and the PVAMC uses the VistA-based Computerized Patient Record System. The project re-analyzed data from the Diabetes Control and Complications Trial (DCCT) to determine evidence in a randomized, controlled trial setting regarding the impact of an individual’s variability in glycosylated hemoglobin (HbA1c) outcomes, and the suitability of using HbA1c variability over time in addition to, or as an alternative to, the absolute level of HbA1c as a quality measure. The result of the analysis is intended to create a new set of quality measures that better reflects actual clinical care.

Specific Aims:

• Evaluate structural and clinical issues that may affect the validity of comparisons made by providers using quality measures for diabetes. These include: 1) the manner in which diabetes is defined; 2) the way patients are linked to providers; and 3) the concordance between use of diabetes medications and achieving thresholds for quality-of-care. (Achieved)

• Develop a quality measure for diabetes that accounts for patient heterogeneity in terms of baseline HbA1c and expected trajectory of improvement in diabetes control, based on clinical parameters and other data available through the EMR. (Achieved)

• Explore the DCCT and patient data for year-to-year individual variability in diabetes control to assess the impact of variability over time in an individual’s diabetes control on microvascular outcomes. (Achieved)
**2010 Activities:** In 2010, with the departure of the project team’s biostatistician, new statisticians were brought onto the team to explore the possibility of developing a composite measure of quality that encompassed the degree of HbA1c, blood pressure, and low density lipoprotein cholesterol control. Unfortunately, the data exhibited only weak correlations across the indicators, and therefore a composite measure would not capture the heterogeneity in the components. The team then focused on new approaches to prediction of HbA1c control with the goal of developing a novel quality measure that ranks providers in terms of their patient panel’s variance from their expected HbA1c values, rather than the proportion of the panel that achieves a fixed, absolute threshold.

Looking more closely at the overall average HbA1c over time, the team found data that affected the initial choice of an analytical time period of 2007. In 2006, there was a problem with the reagents used to measure the HbA1c which artificially lowered the HbA1c results by about 0.3 for a 6 month time period. Rather than apply a correction to these numbers, the project team shifted the analysis forward in time to HbA1c numbers in 2009 and used data from 2007 and 2008 in the predictive model.

Using this new observation period, a number of models were developed and compared to predict current HbA1c, starting with a full set of demographic and diagnosis information. The team also looked at models that included medication use. Because variables sometimes appear to have predictive capabilities by chance, a bootstrap LASSO method was applied to select only predictor variables that appear consistently across multiple iterations of cohort selection for the test set. The team also compared the quality rankings derived from these models, and conducted a chart review of a sample of patient panels where the provider ranking was consistently high, consistently low, or varied depending on the model chosen.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of September 2010):** The project met all aims and milestones upon completion of the no-cost extension period.

**Impact and Findings:** The strongest predictors of current HbA1c value were age, income, and the number of antidiabetic medication classes that were ever used by the patient. Another interesting predictor that was consistently seen across models was heart rate, where higher heart rate was a marker for worse HbA1c control. Lastly, an important predictor of current HbA1c level was the prior level of control. Ninety-six percent of patients whose baseline average HbA1c was less than seven continued to have a current HbA1c that was less than seven. Only three percent of these patients had an increase of more than 20 percent in their HbA1c. Among patients with a baseline HbA1c between seven and nine, 84 percent continued to have an HbA1c within 20 percent of baseline, while 10 percent had a greater than 20 percent improvement, and 6 percent had a less than 20 percent worsening of HbA1c. Among patients with a baseline HbA1c greater than nine, only 65 percent stayed within 20 percent of their baseline, with 31 percent improving and 4 percent worsening by more than 20 percent. The model that included all of these factors was anchored roughly by prior HbA1c, and fine-tuned by the other clinical and demographic parameters. No diagnosis category was consistently selected as a predictor of current HbA1c.

As expected, some providers had large changes in their rankings of HbA1c control among their patients, depending on the model of quality that was chosen. One problem with the ranking is that, across all predictive models, the standard error of the expected level of HbA1c is large. Therefore, the confidence intervals around the differences between current HbA1c and the expected A1c was also large. As a result, almost all of the rankings except for the best- and worst-performing providers are statistically indistinguishable from each other. Across a group of 180 providers, the provider ranked 20th is not so
dissimilar from the provider ranked 100th in terms of the overall difference between the actual and expected HbA1c levels in their respective panels. Still, chart review of a sample of patient panels where the point estimate of the expected and actual HbA1c difference was used to rank providers did demonstrate compelling findings.

Under the new model, a low ranking can mean that a provider has an already-well-controlled group of patients that she or he is maintaining under control and has a few poorly controlled patients, some of whom are getting better, while others are getting worse. In contrast, a higher ranking can reflect a better-than-expected improvement in HbA1c control among patients starting with poor control. Any system for ranking provider quality of care will have its supporters and detractors. Providers who are ranked highly under one method whose quality appears worse under a different method are likely to find fault with the method in which they perform more poorly. Indeed, many provider ranks change substantially under the new quality measurement method compared with the current National Committee for Quality Assurance (NCQA) standard. Some may argue with the fact that the new method appears to reward providers for improving HbA1c control in patients, even if they do not reach NCQA targets. This new method does not reward providers for sustaining HbA1c less than seven in their patients, despite the importance of this capability. Under the new measurement method, providers are rewarded not only for achieving important goals, but also for achieving difficult goals.

To the extent the achievement of high-quality rankings can help motivate physicians, such an approach will discourage providers from being satisfied with the status quo or, worse, transferring their poorly-controlled patients to other providers. Instead, the new method encourages providers to take on new patients with poor control and work hard to help them improve their diabetes control.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Using Information Technology to Improve the Quality of Cardiovascular Disease Prevention and Management

Principal Investigator: Williams, Andrew, Ph.D.
Organization: Kaiser Foundation Research Institute
Grant Number: R18 HS 017016
Project Period: November 2007 – June 2010
AHRQ Funding Amount: $605,862
Summary Status as of: June 2010, Conclusion of Grant

Target Population: Adults, Chronic Care*, Heart Disease
Summary: Data from electronic medical records (EMRs) have the potential to far surpass claims data and other secondary data sources in the quality of results they make possible in nearly every area of health services research. For this promise to be fulfilled however, significant methodological advances are required that will establish new principles for defining care quality metrics, disease ascertainment, and that meet other measurement challenges inherent in working with EMR data. This study sought to use EMR data to determine the relationship between patterns of preventive and disease management care for cardiovascular disease (CVD) and the occurrence of disease events that this care is designed to prevent.

The study developed EMR-based quality indices for 11 cardiovascular primary care services. It related physicians’ prior index scores to subsequent disease incidence and to care utilization in their patients. Data for the study were collected over an 11-year period by two Kaiser Permanente organizations covering approximately 750,000 persons in Hawaii and the Pacific North West of the United States, representing geographically and ethnically diverse populations. Both organizations used customized variations of Epic System’s Certification Commission for Health Information Technology-certified EMR, HealthConnect.

Two index types were developed for defined annual intervals based on observations of defined populations: prevention indices (PIs) and disease management indices (DMIs). The PI is a measure of the extent to which a screening or preventive service was delivered to a defined population during a defined interval. The DMI is a measure of how effectively a disease or condition was managed in the population defined by the pertinent diagnosis during a defined interval.

This study focused on the relationship between patterns of preventive and disease management care by primary care providers (PCPs) of patients with CVD. Indices looked at for DMI included: diastolic blood pressure (BP), systolic BP, serum lipids, hemoglobin A1c, use of beta blockers, use of angiotensin converting enzyme inhibitors, and use of angiotensin receptor blocker. Indices for PI included: BP, serum lipids, hemoglobin A1c, weight, and tobacco use. The hypothesis for all combination of services and outcomes was that higher PCP-level index scores would be associated with lower rates of incident CVD and health care utilization within each patient panel.
Specific Aims:

- Identify practice-level primary care variations in preventive care, weight management, and selected chronic disease management, including drug prescription patterns aimed at reducing CVD morbidity. (Achieved)
- Determine the associations of quality of preventive care and disease management practices to morbidity, mortality, and costs of care. (Achieved)
- Improve delivery of care. (Achieved)

2010 Activities: In 2010, eight data specification templates were completed. Data extraction, analysis and documentation of results were the major focus of activities during this period.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project was completed with all major aims achieved.

Impact and Findings: Longitudinal and cross-sectional variation in practice patterns differed by service type and by organization. Higher DMI scores for BP were associated with lower incident disease and care utilization. The PI for lipid screening was associated with reduced annual outpatient care utilization.

The study team concluded that there are many causes of failure to provide recommended care. Some are difficult for health systems to address such as inadequate resources, poor quality clinical guidelines, and inaccurate or nonspecific diagnostic tests. Other causes should be more easily addressed including organizational deficiencies, clinician failure to recommend appropriate services, and patient refusal to follow recommendations. In settings where EMR data are accessible to providers and patients, the PI and DMI evaluate care based on the same information available to the parties who are accountable for care. Quality indices based on PI and DMI information have a basic functional validity. Several of the indices developed in the project show sufficient promise to warrant additional development.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decision making through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Bringing Measurement to the Point of Care

**Principal Investigator:** Wu, Winfred, M.D.  
**Organization:** New York City Department of Health and Mental Hygiene  
**Mechanism:** RFA: HS07-002: Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health Information Technology (EQM)  
**Grant Number:** R18 HS 017059  
**Project Period:** September 2007 – September 2010, Including No-Cost Extension  
**AHRQ Funding Amount:** $694,961  
**Summary Status as of:** September 2010, Completion of the Grant

**Target Population:** Adults, Inner City*, Low SES/Low Income*, Medicaid, Medically Underserved, Racial or Ethnic Minorities*: African American, Hispanic/Latino, Safety Net, Uninsured

**Summary:** The overall goal of this project is to implement meaningful measurements of the quality of care that focus on public health priority issues, disadvantaged populations, and small office practices. The New York City Department of Health and Mental Hygiene (DOHMH) Take Care New York initiative has articulated 10 priority public health issues that require coordinated action between health care providers, patients, community organizations, and government agencies. The DOHMH Primary Care Information Project (PCIP) uses health information technology for population-wide measurement and improvement of clinical care in these 10 domains, particularly among disadvantaged populations. Over 1,000 medical providers have implemented electronic health records (EHRs) with enhanced preventive care functionality. Ambulatory Certification Commission for Health Information Technology-certified EHR products include Epic, NextGen, and eClinicalWorks. Clinical partners include New York City’s Federally Qualified Health Centers, several hospital outpatient departments, and hundreds of primary care providers in small office settings. A set of 38 clinical quality measures designed to address priority public health issues has been developed, and automated reporting of these measures internally and to the DOHMH will be coordinated with the EHR vendors.

Successful EHR-enabled quality measurement requires that physicians document relevant information at the point of care. The research team developed a simple and intuitive clinical decision support system (CDSS) with eClinicalWorks, suitable for small office practices, that integrates quality measurement and clinical decision support at the point of care. The CDSS displays a dashboard of quality indicators as part of the patient’s record, showing the patient’s measurement cohorts and whether their care complies with screening and treatment recommendations. Integrated decision support tools enable providers to take appropriate action to bring the measure into compliance or remove the patient from the measurement cohort due to valid exclusions or contraindications.

Limited to small physician owned practices, the project uses a randomized controlled trial to assess the impact of pay-for-quality incentives on quality measurement and improvement across four of the quality measurement areas. A case-control study was conducted to assess the impact of CDSS on quality measurement. The project also uses a pre- versus post- EHR survey to measure the impact of EHR adoption on provider attitudes and engagement with quality measurement and incentivized care.
Specific Aims:

- Validate a set of automated clinical quality measures that addresses priority public health issues. (Achieved)
- Characterize provider attitudes and measure provider satisfaction with performance indicators. (Achieved)
- Design a simple and intuitive point-of-care quality measurement and decision support user interface (quality dashboard). (Achieved)
- Conduct a randomized clinical trial to determine the impact of this quality dashboard on the accuracy of, and provider satisfaction with, EHR-derived quality measures. (Achieved)
- Disseminate findings through the National Quality Forum’s Standardizing Ambulatory Care Performance Measures project through the EHR vendors’ participation in this project and through reviewed publications. (Achieved)

2010 Activities: The PCIP EHR development team, in collaboration with eClinicalWorks, completed validation of the automated calculation of selected quality measures. The research team worked with the EHR vendor to test and verify the automated calculation of measures. A separate team compared the monthly data collected from the quality measures against other data sources (e.g., encounter data, self-reported practice and provider characteristics, and potential rise of symptoms related to infectious disease—syndromic surveillance) available within the health department.

The grant team completed development of the provider survey, assessing provider attitudes and satisfaction with the performance indicators. The survey focused specifically on clinical decision support at the point of care, whether any of the features were used, the functionality of the features, and opinions about the features. Survey findings were supported by qualitative data which provided insights into how the technology was and was not working well.

Recruited practices were enrolled in a privately-funded pilot recognition and pay-for-quality program, Health eHearts, because they had adopted an EHR prior to 2009 and were focusing on quality measurement through the incentive program. Of the 84 practices that participated in Health eHearts, 56 practices, representing 154 providers, agreed to electronic record review and abstraction. Interviews were conducted, and two sets of provider surveys were administered to the providers that adopted an EHR through the PCIP program.

Analysis of the manual chart review data was completed and a regression model was used to assess whether practices experienced more rapid increases post-CDSS implementation. Charts were reviewed for three time periods: 1) pre-EHR implementation (likely to be paper documentation), 2) the period from EHR implementation until the reminder CDSS system was implemented (approximately 6 to 18 months), and 3) post-implementation of CDSS system (a minimum of 6 months later). Each patient record was reviewed for documentation to identify whether the patient was eligible for inclusion in the denominator and, if the patient was eligible, whether he or she met the numerator criteria.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The grant ended in September 2010 with all major aims achieved. The budget was somewhat underspent.

Impact and Findings: Across 56 practices and reviews of over 6,100 patient records, most practices did not have prior quality measurement experience or engage in quality improvement activities prior
to adoption of an EHR. Following implementation of the CDSS and additional technical support from PCIP, practices increased their rates of clinical preventive services by at least five percentage points across six of ten selected quality measures. Providers found some documentation tasks within the EHR to be relatively straightforward, while other data entry processes posed challenges with downstream effects for quality measurement and reporting. Without manual review of the electronic records, many of the practices would underreport their performance when using automated EHR-derived quality reporting.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
## Table 9. Grant Summaries (Health Information Technology PAs)

### Small Research Grant to Improve Health Care Quality Through Health Information Technology (IT) (R03)

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### Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (IT) (R21)

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Improving Patient Access and Patient-Clinician Continuity Through Panel Redesign

**Principal Investigator:** Balasubramanian, Hari, M.S., Ph.D.

**Organization:** University of Massachusetts Amherst

**Mechanism:** PAR: HS08-268: Small Research Grant to Improve Health Care Quality Through Health Information Technology (IT) (R03)

**Grant Number:** R03 HS 018795

**Project Period:** February 2010 – February 2012

**AHRQ Funding Amount:** $100,000

**Summary Status as of:** December 2010

**Target Population:** Not Applicable

**Summary:** Primary care practices in the United States must balance the timeliness of care delivery with its continuity, i.e., balance the lead time for appointments with the goal of having patients see their own primary physician whenever possible. Timeliness and continuity are intrinsically tied to the makeup of the patient population—the “physician-patient panel”—that a physician oversees.

Using patient appointment data, physician-patient panel sizes, and physician case mix, Dr. Balasubramanian and his team will investigate how group practices can dynamically manage physician-patient panels to improve timeliness of access and continuity. They will develop a quantitative decision support system to help clinicians, practice managers, and health systems answer the following questions:

1. How should patient-patient panel composition be altered over time to best match patient demand with physician supply?
2. How should practices best match patient and physician preferences, while simultaneously considering the influence of panel size and case mix on patient access?
3. How many additional new patients can be empanelled without adversely affecting the goals of timely access and continuity?

In developing the system, Dr. Balasubramanian will construct a general modeling framework for managing physician-patient panels in a group practice and will utilize systems engineering methods (optimization and discrete event simulation) to model the system over time. By incorporating specific features, such as patient and physician preferences, changes in scheduling regimens, group visits, and changes in the supply and demand dynamics of a practice, the project team will extend the framework’s applicability to various primary care settings. The models will be disseminated through a Web-based decision tool.

**Specific Aims:**

- Develop a modeling framework that can translate generally to various primary care settings. *(Ongoing)*
- Extend the model’s ability to dynamically generate optimal panels and incorporate changes in physician availability and patient demand over time. *(Ongoing)*
- Develop and disseminate the first two aims in a Web-based decision support tool for clinicians, practice managers, and health care systems. *(Upcoming)*
2010 Activities: Retrospective data from two clinics have been used to develop computer simulation models to optimize physician-patient panels. Visit rate, patient co-morbidities, case mix, physician preferences, and physician capacity were assessed as model inputs. Particular focus was paid to the use of physician teams to manage urgent care appointments and maximize continuity of care. Another modeling approach considered reallocation of patients with the least co-morbidities from physicians with high patient burden to those with lower patient burden, under the assumption that this is less disruptive to patient care and patient-provider relationships. In the context of medical resident education, where a heterogeneous physician-patient panel offers greater learning opportunities, Dr. Balasubramanian is developing measures of physician-patient-panel diversity. These measures, including the mean number of co-morbidities by panel and proportion of disease classes represented in the panel, will serve as additional model inputs. Ultimately this modeling framework will be used to guide the design of the Web-based decision support tool.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is meeting most of its milestones on time. Due to delays initiating the project at the start of the grant period, the budget is somewhat underspent.

Preliminary Impact and Findings: The team compared not yet optimized panels with optimized panels at current physician demand and with a 10 percent increase in physician demand. The models indicate optimized physician-patient panels increase physician capacity and may create an opportunity to mitigate physician shortages. The optimally designed panels with the 10 percent increase in demand offered more capacity than the not yet optimized panels without the increased demand.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Assessment of Pediatric Look-Alike, Sound-Alike Substitution Errors

**Principal Investigator:** Basco, William, M.D.

**Organization:** Medical University of South Carolina

**Mechanism:** PAR: HS08-268: Small Research Grant to Improve Health Care Quality Through Health Information Technology (IT) (R03)

**Grant Number:** R03 HS 018841

**Project Period:** April 2010 – March 2012

**AHRQ Funding Amount:** $100,000

**Summary Status as of:** December 2010

**Target Population:** Pediatric

**Summary:** Look-alike, sound-alike (LASA) medication errors occur when a patient receives an incorrect medication because its name is spelled like or sounds like another medication. While medication errors have been studied in the pediatric population, the frequency of LASA-specific errors in pediatric prescriptions is not well documented or understood.

This study will identify pediatric medications that are at highest risk of causing child harm through LASA errors and refine a method for “flagging” individual prescriptions as potential errors. Research methodology will use a modified Delphi approach that uses a panel of practicing general pediatricians to define a target list of 200 LASA medication pairs. The error rates of these 200 medication pairs will then be estimated by reviewing patient medication histories and diagnostic data. After estimation of the error rate, the positive predictive value will be identified for the screening alerts.

Research results could help guide the creation of a computerized set of pediatric-specific LASA screening alerts that could be implemented in the pharmacy setting to reduce LASA errors for children. This research will lay the groundwork for development of a larger-scale implementation study in pharmacy settings, with the goal of reducing pediatric ambulatory LASA errors.

**Specific Aims:**

- Identify a subset of known LASA drug pairs that are prescribed in ambulatory pediatric care. *(Ongoing)*

- Estimate frequencies of screening alerts (potential LASA substitution errors) in these drug pairs, and determine the positive predictive values (true positives) of the screening alerts. *(Ongoing)*

**2010 Activities:** The project began by identifying the LASA list of medications. The team used two established lists, removed duplicates and, through the assistance of a clinical pharmacist, decided which drugs to remove from the entire list. Beginning with 17,000 medications, the team eliminated LASA pairs where one of the drugs in the pair is either IV, topical, or where the pairs represent similar drugs (e.g. extended-release versions of a drug versus the non-extended release version). This resulted in a list of 917 drug pairs that need further review. These are the drugs that will be included in the Delphi process to identify pairs that are of greatest concern to pediatricians should a substitution occur.
The Delphi process will occur through an online survey that was in development in 2010. After an initial pilot, the team made alterations to the form of the online survey and piloted the second version. Based on that feedback, the team altered the survey a third time to capture more detail on the reasons why the pediatricians made their decisions regarding any given drug pair.

The pairs will be presented reciprocally so there will be a total of approximately 1,800 pairs in the surveys. The grant team is now building 37 individual surveys to parse the 1,800 pairs into a manageable number for each survey participant. Each survey will have 50 drug pairs. The survey questions will be framed in the following form: “Let’s say a child has to be on adderall every day, and by mistake they get inderal.” The respondents score “How bad is it to get inderal by mistake? How bad is it to not get the adderall?” The principal investigator has recruited pediatricians from around the country to participate and fill out the LASA survey.

To measure the error rates of the final list of medication pairs, the team will review patient medication histories and diagnostic data. The team has successfully obtained the Medicaid data for this component of the evaluation and has removed all duplicate entries. Further, they have identified a Food and Drug Administration file that contains cross-references for brand name drugs with their corresponding generic names, allowing the electronic linkage of drugs that are the same but have different names.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Progress is on track in some respects but not others. About 65 to 80 percent of the milestones are being met, but there is a viable plan for achieving the others, and the team is staying close to schedule. The process of developing the final list of drug pairs and developing the surveys has required more time than originally planned, however the project team expects to meet target date for data collection completion. Project spending is on track.

**Preliminary Impact and Findings:** The project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

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* AHRQ Priority Population
Developing and Evaluating Online Education to Improve Older Adults’ Health Information

**Principal Investigator:** Fink, Arlene, M.A., Ph.D.  
**Organization:** Langley Research Institute  
**Mechanism:** PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (IT)(R03)  
**Grant Number:** R03 HS 019745  
**Project Period:** September 2010–September 2012  
**AHRQ Funding Amount:** $52,119  
**Summary Status as of:** December 2010

**Target Population:** Adults, Elderly

**Summary:** An increasing number of Americans, including seniors, are turning to the Internet for information about health care. However, the ability to identify accurate, high-quality health Web sites can be difficult. There is little data about older consumers’ awareness of varying quality of health care information on the Internet, and whether or not seniors are able to distinguish between high- and low-quality Web-based health information.

The goal of this project is to develop and evaluate the first theory-based online health educational program for people 55 years-of-age and older. The program aims to improve older adults’ ability to identify high-quality health Web sites and to promote self-efficacy for communicating with physicians.

The project will conduct focus groups to identify older adults’ preferences for online learning about health topics to inform the design of an interactive online educational program. The use of the interactive educational program will be compared to educational materials that are not interactive and not geared specifically to older adults. Interviews with users of each of the two programs will document differences in participants’ knowledge and skill in identifying high-quality health Web sites and self-efficacy in communicating with physicians. The project will result in a theory-based educational program developed with the cooperation and advice of older health consumers.

**Specific Aims:**

- Convene focus groups to identify older adults’ preferences for online learning about health. *(Ongoing)*
- Develop an interactive online educational program to teach older adults to improve their knowledge and skills in identifying high-quality health Web sites and enhance their ability to efficaciously communicate with their physicians. *(Upcoming)*
- Pilot test the feasibility of the program. *(Upcoming)*
- Evaluate the outcomes of the new program compared to an alternative. *(Upcoming)*

**2010 Activities:** During the first quarter of the project, Dr. Fink conducted three patient focus groups to identify older adults’ online learning preferences. Participants were recruited by a community partner through flyers, newsletters, articles in the local newspaper, and mailings. The focus groups were conducted in a flexible semi-structured format to allow participants to bring up topics that matter to them, to build...
conversation from what other group members discuss, and to allow the moderator to probe for deeper insight into discussions. Questions focused on Web sites used for health searches, topics of interest, ways to inform older people about the proposed program, the role of friends and families in guiding health information Web searches, and how to evaluate the accuracy of Web-based health information.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project milestones and aims are completely on track. The project budget is somewhat underspent to conserve resources for program development, the most cost-intensive part of the project.

**Preliminary Impact and Findings:** The preliminary findings from the focus groups indicate that the majority of participants use Google as an initial portal for health information, while several participants, upon recommendations from their providers, use sites associated with well-known medical institutions. There was general agreement that participants had no systematic method or criteria for evaluating health information, aside from cross-checking multiple Web sites. Participants agreed that a list of high-quality sites and criteria for evaluating information would be very useful. The overwhelming amount of information on the Web was reported to be a major barrier to effective use. There was near uniform agreement that an education tool with trial exercises would be beneficial.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Impact of Health Information Technology on Primary Care Workflow and Financial Measures

Principal Investigator: Fleming, Neil Stewart, M.A., Ph.D., C.Q.E.  
Organization: Baylor Research Institute  
Mechanism: PAR: HS08-268: Small Research Grant to Improve Health Care Quality through Health Information Technology (R03)  
Grant Number: R03 HS 018220  
Project Period: October 2009 – April 2011, Including No-Cost Extension  
AHRQ Funding Amount: $99,955  
Summary Status as of: December 2010

Target Population: Adults, Pediatric*  

Summary: Little is known about the impact of commercial off-the-shelf electronic health record (EHR) systems on primary care workflow and financial measures, or about the financial and non-financial costs of implementation and maintenance of these systems. Given the goal of universal EHR use in the United States, such knowledge is of immediate and critical importance for the multiple stakeholders in the health care delivery arena.  

The HealthTexas Provider Network (HTPN), a large fee-for-service ambulatory care physician network affiliated with an integrated health care delivery system in North Texas, began a staggered 3.5 year rollout of GE Centricity, an “off-the-shelf” Certification Commission for Health Information Technology-certified ambulatory EHR system, in mid-2006. Using billing and administrative data, the investigators are prospectively examining the impact of the implementation and maintenance of the ambulatory EHR on 26 primary care practices’ workflow and financial measures. Investigators are also examining the financial resources consumed and the non-financial time and effort costs of the HTPN implementation team and practice physicians, nurses, and office staff preparing for implementation. Due to the staggering of the EHR implementation, comparisons will be both cross-sectional (between EHR and non-EHR practices at set points) and longitudinal (between measures collected at the same practice pre- and post-EHR implementation).  

The study will contribute to knowledge regarding frequently-cited perceived barriers to ambulatory EHR adoption, including uncertainty regarding financial and non-financial costs of implementation, loss of productivity during implementation, interference with workflow, and return on investment. Reducing uncertainty in these areas should inform real-world health information technology (IT) implementation decisions and stimulate more comprehensive health IT implementation research in ambulatory care settings. Understanding the workflow and financial impacts, as well as financial and non-financial costs related to implementation of health IT, is important for stakeholders at all stages in the ambulatory EHR decision process, including adoption and implementation.  

Specific Aims:  
• Estimate the effect of the EHR on workflow outcome measures. (Ongoing)  
• Estimate the effect of the EHR on financial measures. (Ongoing)
• Quantify financial and non-financial costs of implementation and maintenance, providing information regarding perceived barriers and facilitators to adoption and implementation of the EHR. *(Achieved)*

**2010 Activities:** Dr. Fleming and his team completed the work for the third aim, quantifying the financial and non-financial costs of implementing the ambulatory EHR. Financial costs included those pertaining to purchases of hardware, software, and system resources. Non-financial costs related to time and effort of the HealthTexas EHR implementation team; time the physician champions, nurse superusers, and office managers spent overseeing EHR implementation tasks (e.g., planning, workflow reengineering, and training); and time spent by individual physicians, medical staff, and office staff preparing for EHR use (e.g. pre-loading charts, training). As part of this work, the project team engaged in key informant interviews with operational leadership, including the vice president of informatics and the manager of training and workflow, to understand and quantify the implementation and maintenance costs for activities during the 120 days pre- and 60 days post-“Go Live” from three perspectives: 1) the physician network’s implementation team; 2) the individual practice implementation teams consisting of the physician champion, EHR practice manager, and both clinical and non-clinical staff; and 3) the end-users.

Dr. Fleming and his team made considerable progress in preparing the dataset for the first two aims, including the collection of administrative data containing the covariates and outcome variables for the statistical models. Their covariates will reflect summarized practice characteristics including average number of years with HTPN, specialty, average patient age, and percentage of female patients. The analytic dataset is complete and the team has begun to design and construct the data analytical platform in MS-SQL Server, MS-Access, and SAS that will be used to test the impact of the EHR implementation through comparisons of pre- and post-implementation data. The patient level visit-related data from the administrative system have been coupled with the individual physician and practice-level data. The analytic variables have been constructed regarding the implementation (2006-2007 versus 2008) and time in relation to implementation (prior to implementation, 1 to 6 months, 7 to 12 months, and greater than 12 months post-implementation). The Non-physician Staff per Physician Full time Equivalent is the last variable to be constructed with attention being made to the consideration of primary care effort. The outcome data are now being reviewed for potential outliers.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is reported as on track in some respects but not others and budgeted funds are somewhat underspent, by approximately 5 to 20 percent. However, Dr. Fleming and his team received a 3 month no-cost extension and the project is on target to complete within the new grant time frame. Slippage occurred due to the difficult nature of modeling the complex inter-relationships within these data. As the relationships between the independent variables of interest and the outcome variables are non-linear, it has taken more time than anticipated to estimate these relationships.

**Preliminary Impact and Findings:** The project team completed the work for the third aim and results were published in the March *Health Affairs*, “Financial and Non-financial Costs Associated with Electronic Health Record Implementation in the Primary Care Setting”. The analysis takes into account both hardware and software purchases and the time and effort invested in implementation. They estimate the EHR and practice teams spent 611 hours per practice for implementation, and end-users spent 134 hours per physician. For a five physician practice, implementation cost an estimated $162,000, with $85,500 in maintenance expenses during the first year. These results highlight the often hidden costs of EHR implementation, in terms of the time and effort required by individuals at both the leadership and practice level.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Synthesizing Lessons Learned Using Health Information Technology

Principal Investigator: Nemeth, Lynne, M.S., Ph.D.
Organization: Medical University of South Carolina
Mechanism: PAR: HS08-268: Small Research Grant to Improve Health Care Quality through Health Information Technology (IT) (R03)
Grant Number: R03 HS 018830
Project Period: May 2010– April 2012
AHRQ Funding Amount: $99,861
Summary Status as of: December 2010

Target Population: Not Applicable

Summary: Over the past decade, the Practice Partner Research Network (PPRNet) has established a theoretically-informed framework for translating research into practice (TRIP) in small- to medium- sized primary care practices that use the Practice Partner® electronic medical record (EMR). The PPRNet-TRIP Quality Improvement (QI) Model has three components: an intervention model, an improvement model, and a practice development model that assists practices with implementation of QI measures.

This project is conducting an evaluation of the mixed-methods data and lessons learned from a decade of PPRNet-TRIP research. The experience of PPRNet research participants and researchers will enhance understanding of the PPRNet-TRIP components and how they can improve primary care quality. The cross-case analyses conducted through this research will generate important themes, provide new insights, and generate new hypotheses about factors that improve the quality of care through the use of EMRs.

Each project is being reviewed individually for new interpretations and discovery of concepts not previously identified. All source data for each project will be embedded into NVivo 8.0 (qualitative data analysis software) for analyses. The full set of data for each project will be read by Dr. Nemeth using each whole document or component, then re-read, and coded by Dr. Nemeth.

Using the new insights developed through the secondary analysis across all of the studies, a semi-structured interview guide will be developed in collaboration with the PPRNet research team and the expert advisory panel to examine the perspectives of practice participants who have been engaged in previous PPRNet research. This interview guide will be cognitively pre-tested with a small sample of practice participants to ensure that the meanings of the questions are understood consistently, and that participants can articulate what the questions mean. Participants for the interviews on sustainability, maintenance, and team development will be recruited from PPRNet practices that have participated in past studies.

Finally, by identifying the patterns transcending the individual projects, the project team will refine and validate the PPRNet-TRIP QI model and its three components: intervention, improvement, and practice development. Using the combined observation data from practice site visits, group and individual interviews with practice participants, interactions of practice liaisons at best-practice network meetings, and ongoing correspondence in conjunction with quantitative practice performance data on the specific
measures related to each particular study, this project will identify strategies implemented and the barriers and facilitators of QI efforts by practices using EMRs. The secondary analyses of the primary findings in a context separate from the individual study, using “immersion and crystallization,” will allow new interpretations and learning about how the research team and the primary care practices within the research network have evolved to improve quality while implementing health information technology.

Specific Aims:

- Complete a mixed-methods secondary analysis to synthesize findings related to improving quality using health information technology in primary care across seven nationally-funded PPRNet initiatives. (Ongoing)
- Examine current perspectives of PPRNet-TRIP study practice participants related to developing and sustaining QI efforts and team development for an increasingly active health care delivery role through robust EMR implementation. (Ongoing)
- Integrate findings from PPRNet’s previous studies with the current perspectives of practice representatives to refine the overarching theory-based “PPRNet-TRIP QI Model.” (Ongoing)

2010 Activities: The primary focus of this year was the first aim, which will inform the second and third aims, listed above. Mixed-methods data from three of the projects were reviewed during this period, including Colorectal Cancer Screening in Primary Care; Implementation and Evaluation of Electronic Standing Orders; and Medication Safety-Translating Research into Practice. In the review of these data, concepts were clarified and will be compared to the other studies. Data were extracted from a variety of sources including e-mail, meeting notes, site visit evaluations, focus groups, and interviews for analyses within the NVivo database.

As these three studies were recently completed during the reporting period, the primary qualitative analyses had fresh insight towards “newer concepts” that were not part of the original PPRNet models. Manuscripts pertaining to these most recent studies were revised, refined, clarified, and submitted for publication. Ongoing use of the NVivo database will be used to complete the secondary analyses of the seven studies. Preliminary revision of conceptual framework was initiated and will be tested for validity.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): This project is in the start-up phase and is meeting its aims. Spending is roughly on target.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination
Electronic Medication Management

Principal Investigator: Vawdrey, David Kent, M.S., Ph.D.
Organization: Columbia University Health Sciences
Mechanism: PAR: HS08-268: Small Research Grant to Improve Health Care Quality Through Health Information Technology (R03)
Grant Number: R03 HS 018250
Project Period: December 2009 – September 2011
AHRQ Funding Amount: $99,998
Summary Status as of: December 2010

Target Population: Inner City*, Low SES/Low Income*, Medicaid, Medically Underserved, Racial/Ethnic Minorities*: Hispanic

Summary: When patients transfer to new health care settings, there is an increased risk of medication errors due to incomplete or inaccurate medication information. While most changes to a patient’s medication regimen are purposeful and documented by the care provider, unintentional and potentially harmful medication discrepancies may exist. To decrease such errors, in 2006 The Joint Commission created a National Patient Safety Goal requiring medication reconciliation for each care transition where medication orders are changed or rewritten. Reconciliation compares a patient’s new medication orders with all medications the patient is currently receiving.

In 2008, the New York-Presbyterian Healthcare System (NYP) instituted a structured, electronic process designed to improve medication reconciliation as patients transitioned between ambulatory-to-hospital and hospital-to-ambulatory care settings. Before the adoption of this intervention, pre-admission medications and discharge medications were kept as free-form text in the patient’s electronic health record (EHR). After adoption, medications were documented using a structured electronic medication list shared across NYP’s ambulatory and inpatient EHRs, including the ambulatory and inpatient Certification Commission for Health Information Technology-certified Eclipsys.

This study is evaluating the effectiveness of the electronic medication reconciliation intervention by comparing outcomes pre- and post-implementation in six community-based primary care clinics and two inpatient facilities. Specifically, the study is evaluating: 1) the effects on provider workflow during medication reconciliation; 2) the evolution of the completeness of the ambulatory and inpatient medication lists; and 3) the possible decrease in the number of clinically important unintentional medication discrepancies. These results will yield knowledge on whether the adoption of a fully electronic medication reconciliation process is associated with a decrease in the rate of potentially harmful, unintentional medication discrepancies across care settings.

Specific Aims:

• Assess differences in medication management workflow in two provider cohorts before and after the adoption of electronic medication reconciliation. (Achieved)
• Assess differences in the completeness of documented medication lists in two provider cohorts before and after the adoption of electronic medication reconciliation. (Ongoing)
Assess differences in the rate of clinically important medication discrepancies in two provider cohorts before and after the adoption of electronic medication reconciliation. (Ongoing)

**2010 Activities:** Using an algorithm developed in 2009, Dr. Vawdrey identified 6,079 patients who had transitioned across multiple layers of care, which is defined as a clinic visit followed by an inpatient stay followed by another clinic visit, during the 2-year period of October 2007 through October 2009. Ambulatory visits that did not have an associated electronically available medication list were identified and excluded from the study. Additional activities in 2010 included an electronic chart review by clinical experts to document the completeness of the medication list at all transition points (clinic visit, hospital admission, hospital discharge, and followup clinic visits) and to identify the medication discrepancies that exist between the ambulatory and inpatient medication lists. In addition, the project team completed the work for the first aim: analyzing how the medication reconciliation process affected the ways providers collect, document, and reconcile medications. The results of this aim were presented at the 2010 American Medical Informatics Association (AMIA) Annual Symposium, “Impact of Electronic Medication Reconciliation at Hospital Admission on Clinician Workflow”. Notably, the oral presentation received an AMIA Distinguished Paper Award.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is mostly on track and spending is roughly on target.

**Preliminary Impact and Findings:** The process of performing and documenting medication reconciliation at hospital admission relied on a longitudinal medication list called the “Outpatient Medication Profile” (OMP). Clinician compliance with documenting medication reconciliation was difficult to achieve, but approached 100 percent after a “hard-stop” reminder was implemented. The hard stop reminder locked providers out of the order entry system 18 hours after hospital admission until reconciliation was documented. Before the new process was adopted, the average number of medications contained in the OMP for a patient upon admission was less than 2. One year after adoption, the average number had increased to 4.7, and there were regular updates made to the list. Updating the OMP was predominantly done by physicians, nurse practitioners, and physician assistants (94 percent), followed by nurses (5 percent) and pharmacists (1 percent).

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

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* AHRQ Priority Population
Improving Outpatient Medication Lists Using Temporal Reasoning and Clinical Texts

Principal Investigator: Zhou, Li, M.D., Ph.D.
Organization: Brigham and Women’s Hospital
Mechanism: PAR: HS08-268: Small Research Grant to Improve Health Care Quality Through Health Information Technology (R03)
Grant Number: R03 HS 018288
Project Period: October 2009 – September 2011
AHRQ Funding Amount: $99,949
Summary Status as of: December 2010

Target Population: General

Summary: Accurate and complete medication information at the point of care is crucial for delivery of high-quality care and prevention of adverse events. Medication reconciliation has been mandated by the Joint Commission on Accreditation of Healthcare Organizations. Most reconciliation is done by verbally asking the patient what they are taking and comparing it against a medication list. With electronic systems able to do medication reconciliation, structured data from electronic medical records (EMRs) are aggregated with computerized physician order entry systems’ data into a single reconciled medication list. However, critical information such as a change in medication regimen is often in non-structured narrative sources, such as clinical notes. This information must also be reconciled to document the patient’s complete and accurate medication record.

Structured data in a standard, predictable form can be easily processed by a computer, but narrative data are not codified and thus pose challenges. “Natural language processing” (NLP) is any system that manipulates free-form text or speech. NLP applications have been developed to identify and extract medical information from non-structured sources; however, few projects have examined the use of NLP as a method for improving medication reconciliation.

This study is investigating the feasibility of extracting medication information from non-structured electronic clinical sources within the Longitudinal Medical Record system, the Certification Commission for Health Information Technology-certified ambulatory-care EMR at Partners HealthCare System. The extracted information can be subsequently used by clinicians at the point of care, thereby reducing prescription and administrative errors. The project is piloting and testing the use of NLP and temporal-reasoning applications, which identify the timing of medication use, to automatically extract and encode medication and associated temporal information from clinical texts, and to chronologically order and classify medications. The study will measure the feasibility and efficiency of these methods and identify tools for improving medication reconciliation.

Specific Aims:
- Extract and encode medication information from clinical texts available in an ambulatory electronic medical record system. (Achieved)
- Apply temporal information (a controlled terminology, domain knowledge, and linguistic knowledge)
to develop a mechanism to represent the timing of medication use, detect the changes, and then to organize medications in a chronological order and classify them into appropriate groups. (Ongoing)

- Measure the feasibility and efficiency of the proposed methods and tools for improving the process of medication reconciliation. (Ongoing)

2010 Activities: The project team identified and sampled patients with chronic diseases in the EMR system and had at least one clinic note per year in the two-year study timeframe. The chronic diseases considered in this study include diabetes, hypertension, congestive heart failure, chronic obstructive pulmonary disease, and coronary artery disease. Two types of data were extracted for these patients: clinical notes and patients’ medication information from their structured medication list (SML). The project team manually compared the differences between medications listed on the SML and those recorded in clinical notes to identify the challenges in extracting and encoding medication information included in clinical text.

The research team developed and is currently refining an NLP tool to extract medication names and signatures from free text clinical notes using standard (RxNorm) and local terminologies as a lexicon. The NegEx and ConText algorithms are used to capture contextual information and to tag identified concepts. The TimeText system, a temporal reasoning application, is used to capture durations and other temporal information found within a clinical note.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Project progress is completely on track, meeting all milestones on time and project spending is roughly on target.

Preliminary Impact and Findings: Based on the manual comparison of the medications listed in the SML and the clinical notes, the project team identified several unique characteristics in clinical texts that present challenges for using NLP for clinical texts. These challenges include: notes containing detailed dosing regimen adjustment and status changes; some medications discussed in notes, but not ordered; negation, e.g., “except for the Lasix”; abbreviations; misspellings; and coreference. Based on the preliminary results, they also found that the NLP tool can be used to accurately extract and encode medication names and signatures from clinical notes.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Knowledge Creation
Text Messaging to Improve Hypertension Medication Adherence in African Americans

Principal Investigator: Buis, Lorraine, M.S.I., Ph.D.
Organization: Wayne State University
Mechanism: PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (IT)(R21)
Grant Number: R21 HS 019092
Project Period: September 2010–September 2012
AHRQ Funding Amount: $172,260
Summary Status as of: December 2010

Target Population: Adults, Hypertension, Racial or Ethnic Minorities*: African American

Summary: Hypertension is a major public health concern and is the leading cause of cardiovascular disease worldwide. Chronic hypertension is particularly onerous for African Americans as they are more susceptible to the condition. Poor adherence to prescribed medication regimens is a major problem because, in spite of evidence that hypertension medications can reduce the risk of stroke and myocardial infarction, only about half of patients who have been diagnosed with hypertension adhere to those regimens.

Mobile phones and text messages are becoming widely integrated into daily life and may offer a simple and less labor-intensive way to enhance medication adherence. This project will develop and test an automated text message system to improve medication management by helping individuals self-monitor adherence through medication logging, adherence reminders, and feedback on adherence goals. The text messaging system will be assessed by blood pressure measurements, from baseline to 1 month followup, among African Americans with uncontrolled hypertension, and by participant perceptions of intervention effectiveness and satisfaction. It is theorized that individuals who use a mobile phone-based automated text message system will have improved medication adherence, medication self-efficacy, and blood pressure control.

This research is one of the first theoretically driven text message interventions for improving medication adherence among African Americans. The intervention is a highly-innovative, scalable, and adaptable technological infrastructure that can be applied to other public health concerns.

Specific Aims:

- Utilize patient participant feedback in the development of a mobile phone text message system to improve adherence to antihypertensive medications. (Ongoing)
- Understand the effect of the newly developed text message system on changes in medication adherence, medication self-efficacy, and blood pressure from baseline to 1 month follow up in African Americans with uncontrolled hypertension. (Upcoming)
- Assess participant perceptions of intervention effectiveness and satisfaction in order to guide further system refinement. (Upcoming)

2010 Activities: Two recruitment sites were identified in the original grant application. After receiving funds for the project, the grantee contacted the sites to prepare for the focus groups. The grantee learned
that the first site had recently relocated and that the research assistant who worked at this site resigned, both of which delayed recruitment. The grantee found that the second site was difficult to contact and engage in study participation, and is considering replacing the second recruitment site. These recruitment issues delayed the initiation of focus groups. Additional project activities have focused on preparation for the focus groups, including hiring staff, developing and refining the focus group script, and revising recruitment materials for the internal review board.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is slightly delayed due to the issues with the recruitment sites. The grantee anticipates getting back on track in the first quarter of 2011. The project is somewhat underspent due to the delays described in the 2010 Activities section.

**Preliminary Impact and Findings:** This project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

* AHRQ Priority Population
An Automatic Notification System for Test Results Finalized After Discharge

Principal Investigator: Dalal, Anuj K., M.D.
Organization: Brigham and Women’s Hospital
Mechanism: PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology(IT)(R21)
Grant Number: R21 HS 018229
Project Period: January 2010 – June 2011
AHRQ Funding Amount: $294,052
Summary Status as of: December 2010

Target Population: General

Summary: This project will create an automatic system that notifies physicians when laboratory test results are finalized after discharge and documents these results in patients’ electronic health record (EHR). The system was designed to facilitate communication and to create a collaborative plan of care for in- and outpatient providers during patients’ transition to the ambulatory setting. The impact of this system on physician awareness of test results will be evaluated.

In the first phase of this study, components of the system were developed to: 1) identify laboratory tests with results pending at the time of discharge; 2) obtain the identity and e-mail addresses of appropriate inpatient and ambulatory providers; 3) exclude routinely-ordered tests to avoid provider alert-fatigue; 4) automate final-test notification to providers as they become available by e-mail; and 5) document these results in the ambulatory EHR. The intervention primarily relies upon the inpatient test results system and the admission, discharge, and transfer system to orchestrate the series of events leading to automated notification of test results finalized post discharge.

In the second phase, a cluster randomized six-month controlled trial is being conducted to measure the impact of this system on physicians’ awareness. The study participants are 450 patients who were discharged from the inpatient general medicine and cardiology services at Brigham and Women’s Hospital (BWH). Staff randomized both the responsible inpatient provider (attending physician at the time of hospital discharge) and responsible outpatient provider (the patient’s primary care physician prior to the intervention). Participating physicians’ patients who were discharged from these services and had tests pending during the study period constitute the study population. Patients for whom the physician was both the inpatient and outpatient provider were excluded.

The primary outcome will be awareness of all post-discharge test results among responsible providers. Secondary outcomes will include user satisfaction, awareness of actionable test results as judged by providers, and whether appropriate actions are taken in response to these results after EHR review. Physician awareness will be measured by a survey that will be sent to providers 72 hours after the first finalized test result is available. The results of this study will inform future efforts to optimize this type of intervention at BWH and other institutions trying to minimize this patient safety problem.
Specific Aims:

- Create an automatic notification system to prompt physicians of test results finalized after discharge. (Ongoing)
- Evaluate the impact of this system on physician awareness of test results finalized after discharge. (Ongoing)

2010 Activities: The study team completed Phase 1 of the intervention which included building the notification service for chemistry and hematology test types. Between May and June 2010, the service was pilot tested in a “pseudo-live” environment in which the service ran, but e-mail notifications were suppressed. During this time the team was able to ascertain that the service was functioning according to the research requirements and randomization scheme. The notification service became operational in August 2010.

Phase 2 analysis and development, including pathology and radiology test types, were delayed in order to devote additional resources to developing Phase 1 test types, which took the team more time than anticipated. Phase 2 development was completed in early December 2010 and was briefly tested over a 2-week period. The service was activated for physicians after it was ascertained to be functioning according to specifications.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The randomized controlled trial (RCT) was initiated and the project is focusing on collection of data. The project is meeting most of its aims and budget spending is roughly on target.

Preliminary Impact and Findings: Over a two-week pilot period in which e-mail notifications were suppressed, the system automatically identified 2,992 tests pending from 233 discharges, including 1,159 chemistry and 1,833 hematology results. These figures are somewhat higher than the team expected. The higher amount is likely due to additional tests being incorporated from issues related to the discharge time stamp and code bugs related to ambulatory test results.

A baseline awareness survey was conducted to determine optimal timing for sending study surveys during the trial period. The survey response rate was 62 percent and overall physician awareness of pending chemistry and hematology tests was 22 percent. Preliminary data from the study pilot and the RCT show a trend toward increased awareness for the intervention group as compared with the control group, but these data are crude and the total responses to date are limited.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
### eHealth Blood Pressure Control Program

**Principal Investigator:** Eaton, Charles B., M.D., D.A.B.F.P., M.S.

**Organization:** Memorial Hospital of Rhode Island

**Mechanism:** RFA: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality through Health Information Technology (R21)

**Grant Number:** R21 HS 018238

**Project Period:** December 2009 – November 2011

**AHRQ Funding Amount:** $299,967

**Summary Status as of:** December 2010

**Target Population:** Adults, Hypertension, Low Literacy, Medically Underserved, Safety Net

**Summary:** Memorial Hospital of Rhode Island has designed a two-phase study of the feasibility and acceptability of an e-health model for the treatment of hypertension. The study, the eHealth Blood Pressure (eBP) Control Program, integrates electronic medical records (EMRs) and personal health records (PHRs) with monitoring devices through a Web portal that connects patients to their medical team. The goal of the project is to obtain the necessary pilot data for a randomized practical clinical trial of the eBP Control Program.

The program strives to increase medication adherence, reduce clinical inertia, and improve patients’ BP control. In addition, the program also seeks to improve patient education, collaborative self management support, and care coordination. Phase 1 of the study will develop and field-test a PHR, a home BP monitoring (HBPM) device integrated into the PHR, a BP self-management Web portal, and training materials for a patient navigator. During Phase 2, the team will enroll 30 patients with uncontrolled BP. For the first 3 months of Phase 2, all 30 patients will only use a single component of the intervention program: HBPM. After 3 months the participants will be randomized to either the three-component program (HBPM + PHR + Web portal) or the four-component program (HBPM + PHR + Web portal + patient navigator).

**Specific Aims:**

- Develop and refine a Web-based patient-centered decision support system for BP control using an iterative, user-centered design process so that it meets standards of feasibility and acceptability for patient navigators and participants. *(Ongoing)*
- Determine the appropriate and acceptable patient motivators (i.e., engaging content, social media, and incentives) leading to use of the eHealth BP control program (BP device, PHR, Web portal, patient navigator). *(Ongoing)*
- Develop and begin to field-test a patient navigator training program, a manual of procedures for the patient navigators, and a measure of patient navigator adherence to the training manual. *(Ongoing)*
- Test the functionality, security, and fidelity of the secure data exchange between the HBPM device, PHR, Web-based portal, and EMR interface engine in both test and live (enterprise) environments. *(Achieved)*
- Determine the degree of adoption by participants of the four intervention components (HBPM, PHR, Web portal, patient navigator). *(Ongoing)*
• Estimate the effect sizes of the four-component program relative to the three-component program with regard to patient activation, self-care activities, medication adherence, reduced clinical inertia, and improved BP control with implementation of the e-Health BP control program. (Upcoming)

2010 Activities: In the first quarter of 2010 the patient navigator dashboard was finalized and the lead researchers have completed a training and reference manual for patient navigators on BP care management. Key points in the manual and training include the appropriate interpretation of HBPM results and the need to develop practice-wide decision rules on making timely changes in dosage, frequency of HBPM, and the addition of new BP medications to reduce clinical inertia. A document for adherence measures was prepared to provide guidance on what is an “acceptable” level of adherence for the procedures.

The team continued the development of several applications of the eBP Control Program. Beta testing was conducted by faculty and employees of the hospital and other collaborating partners. The project team noted that testing the system with developers, clinicians, study staff, and patients was very informative. Given the wide range of expertise and perspectives, the study staff was able to evaluate many aspects of the system including technical function, work flow, and end-user perspectives.

The open trial of the eBP Control Program is underway. Patients are recruited through letters sent to the home of potentially eligible patients and a ‘pop-up’ alert in the EMR. At the end of 2010, nine patients completed the telephone survey, participated in the first study visit, and enrolled in the study. To facilitate achieving the 30 patient enrollment goal, recruitment has been opened to additional care teams. Using information from the patients that are ultimately enrolled, the study team will assess which patient recruitment method was most effective.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is on track for this project and the budget is slightly underspent. The research team developed, tested and implemented the eBP Control Program. The study trial has been initiated.

Preliminary Impact and Findings: There are no findings to date for the project.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
An Evaluation of an Interactive Social Media Website for Parents who are Concerned about Immunizing their Children

**Principal Investigator:** Glanz, Jason, M.S., Ph.D.

**Organization:** Kaiser Foundation Research Institute

**Mechanism:** PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (IT)(R21)

**Grant Number:** R21 HS 019760

**Project Period:** September 2010–September 2012

**AHRQ Funding Amount:** $165,301

**Summary Status as of:** December 2010

**Target Population:** Adults, Other Conditions: Pertussis, Varicella, Measles

**Summary:** Immunizations are one of the most significant public health achievements of the 20th century, preventing more than 2 million deaths per year worldwide. However, as the incidence of vaccine-preventable diseases has declined, public concern has shifted from disease transmission to vaccine safety. An increasing number of parents in developed countries now believe the risks of vaccines outweigh their benefits. Research has shown that parents who decline or delay immunizations greatly increase their children’s risk of pertussis (whooping cough), varicella (chicken pox), and measles infections. Research also shows that the health information that vaccine-hesitant parents obtain from the Internet is often inaccurate and biased.

Effective intervention strategies to reduce parental concerns about immunizations are needed. The objective of this study is to develop and evaluate an interactive, social media Web site for parents who are concerned about vaccines. The Web site will feature various social media applications, including a blog, a discussion forum, and a social networking service. It will also be a resource for providers who are interested in obtaining information about the latest vaccine-related concerns and discussing vaccine-related topics with parents.

The Web site will be piloted among patients and physicians of Kaiser Permanente Colorado (KPCO), a closed-panel, group-model health maintenance organization that provides integrated health care services to the Denver-Boulder metropolitan area. The Web site will be moderated by physicians and vaccine researchers at the KPCO Institute for Health Research. Use of the Web site will be qualitatively and quantitatively assessed over time and will include a longitudinal assessment of the pilot cohort’s knowledge, attitudes, and beliefs about immunizations. This pilot investigation will inform future research to implement a larger, integrated behavioral health intervention to reduce parental concerns about vaccinations and increase immunization rates.

**Specific Aims:**

- Design and develop an interactive, social media Web site devoted to immunizations. *(Ongoing)*
- Conduct a qualitative, formative evaluation of the social media Web site using focus groups. *(Ongoing)*
- Qualitatively and quantitatively evaluate Web site usability through one-on-one testing sessions with end users. *(Ongoing)*
• Pilot test the social media Web site with a representative cohort of end users over a 6-month followup period. *(Upcoming)*

**2010 Activities:** The project was initiated in September 2010. Institutional Review Board approval was obtained to conduct focus groups and usability testing of the Web site. The development of the interactive social media Web site is in progress. Vandiver Group, Inc. is building the Web site and KPCO is writing the content.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is meeting all milestones on time and is somewhat under-budget to conserve funds for later cost intensive activities.

**Preliminary Impact and Findings:** This project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Evaluation and Integration of an Automatic Fall Prediction System

Target Population: Elderly*

Summary: Falls among the elderly are a significant cause of morbidity, mortality, and increased end-of-life health care costs. Reducing the occurrence of falls can greatly improve patients’ quality of life. This study seeks to develop a means to relate health and medication changes to falls and to provide measures to predict the risk of falls for elderly residents in assisted living facilities (ALF).

This project recruited 50 volunteer residents from two ALF facilities. Baseline standardized gait and balance (SGB) assessments were completed. The velocity, direction, and duration of the volunteer’s daytime movements in common areas of congregate living settings will be tracked for 12 months by a movement tracking system (MTS) via radio frequency identification devices. Prospective and retrospective fall histories will be evaluated to determine the relationship of SGB and a measure of movement variability called “tortuosity,” (Fractal D) derived from MTS data.

During the study interval, a complete evaluation of participant medications will be conducted, with particular emphasis on identifying and recording the number of psychoactive and non-psychoactive medications that each participant is prescribed. Each participant’s activities of daily living (ADL) status will be measured at the time of enrollment, along with 12-month retrospective data from fall incident records. To the extent possible, information about the causes of falls will be obtained from ALF nursing staff using a fall assessment scale developed at the James A. Haley Veterans Administration Veteran’s Integrated Service Network (VISN8) Patient Safety Center of Inquiry. This instrument will also be used to collect the 12-month prospective fall data. Medications, ADLs, and residents’ history of falls will be treated as covariates in the regression analysis predicting fractal dimension and prospective falls.

The study team hypothesizes that SGB varies significantly with MTS tortuosity measures, allowing tortuosity to be used as a proxy for SGB assessments while yielding improved fall predictions.

Specific Aims:

- Evaluate the relationship between conventional fall-risk assessment measures using performance on SGB tests and Fractal D movement tortuosity measures obtained through the MTS. (Ongoing)
- Evaluate tortuosity changes preceding a fall. (Ongoing)
- Gather requirements for a software module to perform online fall-risk assessment in community-based settings. (Ongoing)
2010 Activities: Recruitment materials were finalized and the equipment located in the two ALF research sites was upgraded to the latest standards of software and firmware to enhance reliability of the results. Subject identification and recruitment was started at both research sites. The team completed recruitment activities and the planned recruitment target of subjects was met.

As of September, all enrolled subjects provided both standardized gait and balance assessments and had generated Mini Mental State Examinations (MMSE) scores. The data from the gait and balance assessments is being prepared for formal analysis by project staff. Preliminary analyses were carried out on the gait and balance measures collected at each assisted living facility.

Fractal D data was collected on 60 subjects. The first set of subjects will complete 12 months of monitoring in February 2011. The team anticipates completing data collection in June 2011 with the targeted 50 subjects.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Significant progress has been made and the project is ahead of schedule. Budget spending is roughly on target. Future tasks will focus on data collection and analysis.

Preliminary Impact and Findings: The mean age of the participants was 73.5 years (SD=12.2). The youngest was 37, the oldest 94. The youngest participant was almost 20 years younger than the next youngest participant. Partly because of the young age of the 37-year-old participant and partly because of the requirement that participants be able to undergo the SGB, the average age for this subset of participants was below the average for previously-published data for these two facilities. The average MMSE score was 18.8 (SD=6.95), on a 0 to 30 scale for which ‘0’ is the lowest. The range and average MMSE scores were similar to previously reported results for participants in these ALFs.

Twenty (57.2 percent) participants ambulate independently. Of those who use assistive devices, one (2.9 percent) uses a cane, 12 (34.3 percent) use rolling walkers, and three (8.6 percent) use wheelchairs. The relatively even split between the 57 percent fully-ambulatory participants and those using mobility aids will be an important basis for classifying participants in future analyses when evaluating the SGB data. The 35 participants collectively generated more than 11 million positional data points. The number of paths ranged widely, from 48 to 4,987, yielding a total of 46,139 Fractal D scores. The Pearson product moment correlation between Fractal D and total MMSE was -0.46, n=35, p=0.006.

In the present analysis, the negative correlations between the two subscales and Fractal D were the same value -0.442, n=35, p<0.008. In both analyses, none of the correlations between the other subscales and Fractal D was statistically significant. The average Fractal D scores of the independent ambulators and those using aids such as canes, walkers, and wheelchairs were 1.27 and 1.26, respectively. The difference was not statistically significant (t=0.554, df=33, p= 0.587).

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
**Promoting Use of an Integrated Personal Health Record for Prevention**

**Principal Investigator:** Krist, Alexander H., M.D.

**Organization:** Virginia Commonwealth University

**Mechanism:** PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (IT) (R21)

**Grant Number:** R21 HS 018811

**Project Period:** June 2010 – February 2012

**AHRQ Funding Amount:** $299,998

**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Patient-centered health information systems have great potential to improve the quality of care by providing centralized medical information, improved patient education and activation, enhanced patient and clinician communication, decision support, and reminders. However, these systems cannot improve health if they are not used by patients and clinicians. Personal health records (PHRs) integrated with electronic medical records (EMRs) are potential tools to promote patient-centered care and ultimately improve health outcomes. Although adoption and use of integrated PHR-EMRs is increasing, effective use of such sophisticated systems typically occurs only within a subset of a primary care practice’s patient population.

In a previously-funded Agency for Healthcare Research and Quality (AHRQ) project, MyPreventiveCare, an integrated PHR-EMR otherwise known as the Integrated Personal Health Record (IPHR), was offered to 2,750 patients in eight primary care practices—about 3 percent of the total practice population. Use of the system increased the overall delivery of preventive services by more than 5 percent, and by more than 10 percent for some specific individual services (colon, cervical, and breast cancer screenings). MyPreventiveCare linked patients to their health information in their physician’s EMR, provided personally-tailored prevention recommendations to patients, linked patients to individualized educational resources and decision aids to activate patients and promote self management, and generated patient and clinician reminders.

This followup project will evaluate whether and how these eight primary care practices can extend the use of MyPreventiveCare to their entire practice population (82,000 patients), and whether similar outcomes and benefits are seen when the system is implemented on a larger scale.

The project will apply organizational change theory to develop guidance on how to integrate MyPreventiveCare into care delivery using practice champions, learning collaboratives, and a patient-centered communications strategy. Study staff will conduct key informant interviews and record and analyze learning collaboratives to understand the mediators and moderators to integration and use of the system. Evaluation of the impact of practice dissemination of MyPreventiveCare is based on the RE-AIM model, a systematic approach to evaluating health promotion interventions that assesses five dimensions: Reach, Efficacy/Effect, Adoption, Implementation, and Maintenance.
Findings from this study will assist in the design of a future practice-level randomized, controlled trial and will inform practices, policymakers, and payers about how to integrate a PHR in typical primary care practices.

**Specific Aims:**

- Measure the utilization of the IPHR when the IPHR is promoted to patients by primary care practices using a patient-centered approach integrated into care delivery. *(Ongoing)*
- Assess how clinicians use information in the IPHR and the IPHR’s impact on the delivery rates of preventive services. *(Ongoing)*
- Explore how well practices integrate the IPHR into care, identify mediators and moderators (patient, provider, and practice characteristics) to IPHR integration, assess the use of the IPHR, and the degree to which it impacts service delivery. *(Ongoing)*

**2010 Activities:** Study staff invited eight practices, each of which had participated in the original AHRQ-funded grant, to participate in this project and all sites agreed. A central learning collaborative for the eight practices was assembled. The 16-member collaborative consists of four doctors, one resident, two office managers, four nurses/supervisors, two reception supervisors, two information technology staff, and the organization’s central director of quality assurance.

In May and June, baseline observational evaluations of each of the study sites were conducted. Two practice liaisons spent a day at each of the eight practices, observed their workflow, and talked with doctors, nurses, receptionists, and office managers. They collected field notes about workflow, beliefs in preventive care, general office culture, and the general decisionmaking process.

While MyPreventiveCare was programmed in the previous grant to work with the Enterprise EMR, which the study practices use, the team made additional changes to integrate MyPreventiveCare into Epic’s and Professional’s EMRs. These changes made MyPreventiveCare more generalizable to other EMRs and more adaptable to changes over time. Between June and September, MyPreventiveCare was re-programmed and reconnected to the Enterprise EMR at the eight study sites, per the specifications stated. The study team queried selected variables entered in the EMR since 2004 and re-matched them with MyPreventiveCare variables.

The data collection process to assess the reach and maintenance of MyPreventiveCare within the Enterprise EMR was completed. This methodology is being used to calculate baseline statistics on reach, and practice- and patient-level maintenance. The calculation of practice- and patient-level maintenance statistics will be repeated 6- and 12-months post-MyPreventiveCare. Post-implementation results will be compared to the baseline.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Progress is completely on track and spending is roughly on target.

**Preliminary Impact and Findings:** The project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Healthy Teens TXT ME: Information Technology to Change Teen Health Risk Behaviors

Principal Investigator: Olson, Ardis L., M.D.
Organization: Dartmouth College
Mechanism: PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality through Health Information Technology (R21)
Grant Number: R21 HS 018214
Project Period: November 2009 – October 2011
AHRQ Funding Amount: $299,978
Summary Status as of: December 2010

Target Population: Obesity, Teenagers

Summary: Adolescence is a time of rapid and complex change during which health risks stem more from the behavioral factors than the biomedical factors. While many behaviors are experimental, habits and coping patterns developed during this developmental stage may continue into adulthood. Research has shown that school-based interventions for major risks are often nominally effective or ineffective. Interventions that use motivational interviewing and technology to enhance screening and counseling of adolescents are costly; intensive; and require additional time, staff, or computer resources not generally available to most primary care providers. This project seeks to utilize information technology (IT) to develop an integrated screening, counseling, and post-visit support system to change two key adolescent health risks: limited physical activity and tobacco use.

The project team will program and test the Healthy Teens personal digital assistant (PDA) screening program software that will support effective clinician counseling about exercise uptake and tobacco cessation. In addition, the software will be programmed to produce a summary report that will transfer data into patient electronic medical records for future reference. A system of IT-based post-health visit supports will be created to help teens increase exercise and decrease tobacco use. The first support will be tailored cell phone text messaging provided to teenagers who indicate that they are interested in behavior change. A Healthy Teens TXT ME social network site will be established for project participants to share experiences and support their change efforts. The text messages sent to teens will inform them about developments and new links on the network site.

Two feasibility pilots of the TXT ME program will be implemented with post-visit support in four primary care practices over 3 months. Clinicians and office staff assessment will determine the utility of and any barriers encountered with the enhanced office system. Two cohorts per feasibility pilot will be recruited from adolescents who indicate at their clinic visit that they want to increase their physical exercise. The first cohort will be the control and its role limited to survey completion. The second cohort will receive the post-visit supports for tobacco or exercise via cell phone text messaging and will have access to the social network site. Teen acceptability and short-term-change efforts will be assessed. Tobacco use messages will be developed during year 2 for later delivery.

Specific Aims:

- Enhance the TXT ME PDA-based health risk screening tool with clinician prompts to support
effective counseling for exercise uptake and tobacco cessation from evidence-based literature and existing public health and patient counseling programs. (Ongoing)

- Develop the format, message delivery algorithm, and technological processes to link PDA-based teen health screening data from the primary care visit to tailored followup health behavior change text messages delivered by cell phone. (Ongoing)

- Develop the prototype of adolescent health behavior change support via a social network Web site that links adolescents in the project and provides access to Web-based resources. (Ongoing)

- Conduct a small feasibility trial of the exercise component of the TXT ME model that will use PDA technology to screen adolescents who are interested in changing exercise patterns and prompt clinicians to provide reinforcement via post-visit text messaging to help teens make these changes. Evaluation will include short-term outcomes related to text message design and health behavior outcomes. (Ongoing)

**2010 Activities:** The study staff explored different models of support for exercise, investigated smoking cessation Web sites for adolescents, and sought input from the target population. Message development included a literature review and key informant data gathering about motivators to change exercise habits. Messages were developed to help teens advance through the following phases: priming to take action, initiating, relapse, and maintenance. Beta testing of the software was completed and modifications were finalized. A social network site was developed to support adolescent health behavior change by linking adolescences to others in the project trying to change a specific health behavior, either exercise or tobacco. Each of the 11 participating sites had clinician training to demonstrate the features of the PDA that prompt counseling with a motivational interviewing approach.

The principal investigator has met with each participating site to discuss and initiate recruitment and enrollment. Given that the study subjects are adolescents, the recruitment process requires contacting both the parent and the adolescent. As of the end of 2010, 105 control patients were recruited, the majority of which have transitioned into the intervention phase. Approximately 40 percent of those who expressed interest in more frequent exercise provided telephone contact information to learn about the study. Sixty-one percent of contacted control subjects ages 15-19 years enrolled in the study. For younger teens, who often did not have a cell phone, the enrollment rate was approximately 20 percent.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is progressing as scheduled. Project milestones are being achieved on time and budget spending is roughly on target.

**Preliminary Impact and Findings:** Early data indicate that 44 percent of younger teens and 57 percent of older teens are interested in increasing their exercise.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
Supporting Continuity of Care for Poisonings with Electronic Information Exchange

Principal Investigator: Poynton, Mollie Rebecca, M.S.N., Ph.D.
Organization: University of Utah
Mechanism: PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality through Health Information Technology (R21)
Grant Number: R21 HS 018773
Project Period: March 2010 – November 2011
AHRQ Funding Amount: $299,078
Summary Status as of: December 2010

Target Population: General

Summary: Exchange of information between poison control centers (PCCs) and emergency departments (EDs) is almost entirely conducted via telephone. In these high-volume and often chaotic settings, however, reliance on verbal communication increases the potential for data loss, delayed time to treatment, and medical error. The electronic exchange of information can improve continuity of care for poisonings, reduce time-to-treatment and medical errors, facilitate communication and availability of data to clinicians at the point of care, and ensure timely followup.

This project will describe the data requirements for electronic information exchange between PCCs and EDs to support individual patient care and care transitions. It will also describe current information exchange scenarios and identify important clinical, operational, and legal considerations. The project team will use multiple approaches, including interviews with clinicians and stakeholders, document review, analysis of recorded PCC calls, storyboarding, and domain-analysis modeling. In addition, a four-round Delphi study will determine consensus among national experts on significant clinical, operational, and legal considerations.

The results of this study will provide concrete guidance for efficient research and development on PCC-ED information exchange, including information technology solutions, standards adoption or development, and policy. Long-term implications include the study of outcomes, quality improvement innovations, and the potential for computerized decision support.

Specific Aims:

- Describe information requirements for electronic information exchange between PCCs and EDs. (Ongoing)
- Describe current data and information exchange scenarios between a regional PCC and an ED. (Upcoming)
- Identify salient clinical, operational, and legal considerations related to electronic exchange of data and information between PCCs and EDs. (Ongoing)

2010 Activities: 2010 activities for this project focused on the preparation and recruitment of participants for the modified Delphi study to identify the clinical, operational, and legal considerations important for electronic information exchange between EDs and PCCs. Monthly team meetings addressed the content...
and conduct of Delphi study. The study team updated and expanded the literature search on electronic information exchange between PCCs and EDs. The literature was reviewed, synthesized, and illustrated with mind mapping software. The following thematic elements were identified: workflow integration, communication, medical error, data ownership, medico-legal issues, financing and sustainability, and adoption. Infrastructure development in support of the Delphi study was completed with the creation of recruitment materials, including letter and e-mail templates, documentation for survey rounds, and a timeline for materials distribution. Delphi participant recruitment was achieved using various methods, including in-person at conferences, word-of-mouth, and via informatics and emergency medicine listservs. By September 2010, the team exceeded their recruitment goal, identifying 71 committed Delphi study panelists, divided between PCC and ED as the primary domain of expertise. The Delphi study was conducted between September and December 2010. In round one, an initial subgroup (n=8) of experts responded to open-ended questions. Using thematic analysis, the study team converted responses to statements representing the spectrum of panelist opinion. Additional statements reflected literature-based concepts and analysis by the research team. In three subsequent rounds, the full panel reviewed statements describing potential outcomes of electronic information exchange, as well as issues affecting adoption and implementation. Results of the modified Delphi study were accepted for a presentation at the Society for Academic Emergency Medicine’s 2011 annual meeting.

In addition, work began analyzing the PCC to ED call recordings. The study team received University of Utah institutional review board approval for this study aim. The call-sampling plan was reviewed, and the team completed call sampling and initiated linkage to files. They will initially analyze 60 cases. If they do not achieve saturation of information (e.g. no new types of data or information), they will sample in 20-case increments until they achieve saturation.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is completely on track, meeting all milestones on time. Project spending is somewhat underspent, approximately 5 to 20 percent.

**Preliminary Impact and Findings:** The response rate for the modified Delphi study was high and stable. The first round response rate was 0.73 (n=8), the second round response rate was 0.77 (n=55), the third round response rate was 0.75 (n=53), and fourth round response rate was 0.75 (n=53). Upon completion of the fourth round, most (115/122) statements had reached consensus. Seven statements failed to reach consensus. Panelists agreed upon importance of most outcomes including effects on communication, information availability for decisionmaking, and medical error. They also agreed upon key aspects of adoption and implementation, and favor systems that support, but do not replace verbal communication and consultation.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
**Improving Health Care Quality Through Health Information Technology for People With Intellectual Disability**

**Principal Investigator:** Rimmer, James Howard, M.S., Ph.D.  
**Organization:** University of Illinois at Chicago  
**Mechanism:** PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (R21)  
**Grant Number:** R21 HS 018766  
**Project Period:** June 2010– May 2012  
**AHRQ Funding Amount:** $300,000  
**Summary Status as of:** December 2010

**Target Population:** Persons with Disabilities

**Summary:** Adults who have intellectual disabilities (ID) face obstacles navigating the health care system that may lead to higher morbidity. Fragmentation of care is frequent, and additional supports are needed to improve the sharing of health information. To address the lack of continuity in care, this project is adapting and testing a personal health record (PHR) meant to meet the needs of people with ID. The PHR, known as the Personal Health Record for Adults with Intellectual Disabilities (PHR-ID), will build upon ongoing work by Special Olympics International in conjunction with HealthOne Global. The PHR-ID will give caregivers and health care providers access to longitudinal data on an individual with ID and will provide alerts on action items in the individual’s action plan.

The PHR-ID will be built from the Special Olympics Healthy Athletes software database, which includes screening, demographic, and health history data. The first phase of the project will gather input through focus groups and health care provider interviews to refine and finalize the PHR-ID content. Interviews with health care providers who specialize in the care of people with ID will establish requirements for the prototype system. Focus groups of adults with ID and their caregivers will review the proposed interface design and discuss expectations of a PHR. During the second phase, a 3-month feasibility study will be conducted to assess the usability, perceptions, and impact of the PHR-ID by caregivers and health care providers. The project will support the development of an infrastructure that provides guidance to caregivers and health care providers as they follow a customized critical care pathway for individuals with ID, thereby improving the coordination and quality of care.

**Specific Aims:**

- Adapt and refine an Internet-based PHR for adults with ID to share Special Olympics Healthy Athletes medical and health screening data with caregivers and health care providers. *(Ongoing)*
- Conduct a feasibility study to examine the usability and user satisfaction of the PHR-ID in sharing electronic health information derived from the Special Olympics Healthy Athletes screening program with caregivers and health care providers. *(Ongoing)*

**2010 Activities:** During the first phase of the project, the team conducted focus groups with health care providers, caregivers, and others to inform the final development stages of the PHR-ID content for persons with intellectual disabilities. The PHR-ID was completed and 39 participants were recruited...
for the pilot study. In November 2010, participants were mailed a USB drive to access the PHR-ID, an introductory letter about the study, and the user guide on how to use the PHR-ID, which included a link to the online baseline survey. The user guide was developed through feedback from the University of Illinois at Chicago research team and Special Olympics International to improve the clarity of instructions for caregivers. The user guide was made into a video format and posted on YouTube on the Special Olympics channel.

The study design includes security measures to protect the Special Olympics athletes’ health information. Therefore, a separate e-mail was sent to each participant with the password needed to access the PHR-ID. The study team created a Google Group to maintain communication with participants and to provide them with easy access to documents. Participants were added as members of the group but, to preserve confidentiality, cannot see addresses of other members. Periodic e-mails and a newsletter have been sent to promote interest in the study and increase retention. The PHR-ID is important because it allows the progress of the patient to be viewed longitudinally. However, over the short study period of 12 weeks, it is difficult to engage families who may have a longer time frame for use. To address this, the project is encouraging use of the PHR-ID as an active record, for example, to record nutritional intake.

Preliminary content analysis of the focus group notes was conducted in November 2010 and used to construct the online barriers survey. Questions in the survey are related to barriers and facilitators to PHR-ID use, home access to the PHR-ID, PHR-ID interface and usage, Internet use and clinical workflow patterns, and general feedback. In addition, parents and caregivers will be asked to interact with the PHR-ID during the interview and to vocalize their thoughts and actions as they complete various activities.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Progress is completely on track as the team is meeting 100 percent of the milestones. Project spending is roughly on target.

**Preliminary Impact and Findings:** This project has no findings to date

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
HIE and Ambulatory Test Utilization

Principal Investigator: Ross, Stephen Eisenhard, M.D.
Organization: University of Colorado Denver
Mechanism: PAR: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality through Health Information Technology (IT) (R21)
Grant Number: R21 HS 018749
Project Period: May 2010 – April 2012
AHRQ Funding Amount: $299,916
Summary Status as of: December 2010

Target Population: General

Summary: One of the purported benefits of health information exchange (HIE) is that it can improve the efficiency of care by reducing redundant laboratory and radiology testing. There is evidence that test utilization is reduced substantially within institutions such as medical centers that implement comprehensive electronic medical records. If physicians can easily access the results of tests that have been done before, they are less likely to repeat them. However, while it is intuitive that HIE across organizations in a community would improve the coordination of care, there is scant evidence that community HIE results in a reduction in test utilization. As the United States explores investments in HIE to improve the quality of care, policymakers and potential stakeholders in HIE, such as health plans, need more estimates of the degree to which HIE improves the efficiency of care.

Mesa County, Colorado, is a rich resource for more definitive assessments of the effects of HIE. Quality Health Network (QHN), a regional HIE that started providing data exchange to Mesa County in 2005, captures nearly all the test results in the county and has been adopted by more than 351 practitioners, which is more than 85 percent of practitioners in the county. There is also evidence that the reductions in laboratory and radiology utilization in Mesa County since HIE was introduced contrast with national trends of steady or increasing test utilization. This study will formally assess whether adoption of a community-wide HIE reduces utilization of laboratory and radiology testing. The primary study design is a retrospective pre-post comparison of providers working in Mesa County medical practices. Because the timeframe for adopting HIE varies across practices, a differences-in-differences modeling approach is being utilized. This approach allows studying the treatment effect of HIE adoption in different subgroups and is used to eliminate observed or unobserved differences that remain constant over time. The approach will include a basic description of cross-sectional patterns for test ordering in each year from 2004 to 2009, examination of trends from 2004 to 2009, and a cross-sectional, time-series analysis. Physician-level data files will be constructed using data collected at the patient encounter and practice level.

The electronic exchange of health information in communities may improve the quality and efficiency of medical care. Doctors can make better decisions when the health information they need is on hand. By assessing whether a robust, mature regional HIE system helped doctors provide more efficient medical care, this project will provide estimates of value that will prove useful for national decisionmakers and local stakeholders in HIE, and will help guide future HIE efforts.
Specific Aim:

- Determine whether adoption of HIE in Mesa County, Colorado is associated with a reduction in test ordering. (Ongoing)

2010 Activities: Institutional review board (IRB) materials were submitted to the Colorado Multiple Institutional Review Board and final IRB approval was obtained in August 2010. The data use agreement for the Mesa County regional health information organization, QHN, was completed and signed by both parties in July. However, there was an unanticipated sale of ManagedCare.com, the agency providing claims data for analysis, to TransUnion shortly after the start of the grant period. This triggered the need to re-write the complex set of business associate agreements among TransUnion/ManagedCare.com and the Mesa County stakeholders, including QHN, Rocky Mountain Health Plan, and the Mesa County Physicians Independent Practice Association. While this process caused a delay in the receipt of the anticipated data extracts, all revised agreements were signed by mid-November. This allowed TransUnion/ManagedCare.com to send a claims dataset to QHN in late November for merging with the “HIE use” dataset and de-identifying providers and patients. A revised dataset was required in early December after missing fields were discovered. The revised dataset of more than 10 million records was being cleaned and undergoing quality checks as of the end of December 2010. The project team is developing descriptive statistics on a 0.1 percent random sample of the data. A more powerful computer was purchased in December to speed analysis of the complete dataset, given its relatively large size.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project was stalled in meeting several aims and milestones due to the sale of ManagedCare.com to TransUnion. However, activities have resumed and there is a plan to get back on track in many of the stalled areas. The project is currently under-budget due to the aforementioned project delays, but expenses are expected to increase now that the delivery of datasets for analysis has occurred.

Preliminary Impact and Findings: There are no findings to report at this time.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
Use of Affordable Open Source Systems by Rural and Small-Practice Health Professionals

Principal Investigator: Williams, Laurie Ann, Ph.D.
Organization: North Carolina State University, Raleigh
Mechanism: RFA: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (R21)
Grant Number: R21 HS 018218
Project Period: September 2009 – September 2011
AHRQ Funding Amount: $299,078
Summary Status as of: December 2010

Target Population: Rural Health

Summary: National efforts focus on improving medical quality and reducing costs by implementing standardized electronic health records (EHRs), which enable secure exchange of health information between different systems. However, rural health care providers and providers with small practices may not have the financial resources or expertise to purchase and maintain expensive hardware and software applications to participate in this effort.

This project seeks to meet the EHR application needs of rural and small-practice ambulatory health care providers throughout the United States using open-source EHR applications that are reliable, secure, confidential, standards and regulations-based, and able to be integrated with other health care systems. Hardware and software installation, usage, and maintenance costs will be optimized to maintain affordability.

The research team has conducted telephone interviews to assess the needs of rural and small practice doctors and is also making detailed assessments of promising open-source EHR applications. These assessments evaluate the functionality, trustworthiness, interoperability, performance, compliance, and affordability of open-source EHRs. In addition, the research team is developing a process that software engineers can use to evaluate existing open-source EHR applications and remove faults and vulnerabilities.

Ultimately, the team hopes to implement servers using open-source EHR applications that enable rural and small medical practices to obtain the benefits of EHR technology. However, even if promising open-source EHR applications are not identified, the platform being developed will function as a testbed system so that practitioners and their support staff or other researchers can continue to conduct research on a variety of health care applications.

Specific Aims:
• Conduct an assessment of the needs of rural and small practice doctors with regard to the capabilities, strengths, and limitations of existing open-source EHR applications. (Completed)
• Identify and evaluate promising open-source EHR applications. (Ongoing)
• Develop and disseminate a process for evaluating the functionality, trustworthiness, interoperability, performance, compliance, and affordability of existing open source EHR applications. (Ongoing)
• Advance software engineers’ understanding of best practices for developing new or enhancing existing EHR applications. (Upcoming)

• Implement servers using open-source EHR applications that enable rural and small medical practices to obtain the benefits of EHR technology as they run their offices and securely store, utilize, and share patient data. (Upcoming)

2010 Activities: The research team continues to work on testing the software development process. They developed a methodology for systematically creating a security test plan based upon system requirements. Additionally, they began an analysis that will inform software engineers who are developing health care applications of the most efficient and effective means of removing faults and vulnerabilities. This analysis is being conducted on five open-source health care information technology applications, specifically EHR applications: OpenEMR, Tolven, PatientOS, WorldVistA, and OpenMRS. In the process, they are finding and reporting vulnerabilities in these applications.

The team completed interviews with physicians and their support staff from four practices. These interviews gathered and analyzed the EHR needs of rural and small practice ambulatory health care providers. Data from these interviews are now being analyzed.

Analysis of open-source EHR applications continues. This effort assesses the capabilities, strengths, and limitations of existing open-source EHR applications towards meeting the needs of rural and small practice doctors. To date the team has identified 177 vulnerabilities in OpenEMR, Astonaut World VistA, and in a concurrent evaluation of a proprietary medical application.

A prototype system was installed on a virtual computing platform. The original plan was to deploy and maintain promising open-source EHR applications. However, sufficiently secure EHR applications have not yet been identified. Until secure EHR applications are found, the system will function as a testbed system through which practitioners and their support staff or other researchers can access and conduct research on the five healthcare applications.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The research team continues to assess open-source EHRs and has installed a prototype system on a virtual computing platform. Interviews with physicians and support staff from rural and small-practice providers have been completed. Progress is roughly on track. The budget is somewhat underspent.

Preliminary Impact and Findings: Through extensive analysis, the team identified 177 vulnerabilities in OpenEMR, Astonaut World VistA, and a proprietary medical application. The team continues to find that most other open-source EHR systems are insecure, and results to date indicate that open-source developers of EHR applications are not aware of possible security vulnerabilities in their program code. However, the team has found one system that may be a viable EHR application. It has some problems but appears to be significantly better than other EHR systems. They are continuing to work with this application and have reported their security concerns to the developer.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Computer Assisted Medication and Patient Information Interface

Principal Investigator: Ziemer, David C., M.D., M.P.H.
Organization: Emory University
Mechanism: RFA: HS08-269: Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (R21)
Grant Number: R21 HS 018236
Project Period: December 2009 – November 2011
AHRQ Funding Amount: $299,998
Summary Status as of: December 2010

Target Population: Adults, Chronic Care*, Diabetes, Racial or Ethnic Minorities*: African American

Summary: Although many studies show that the complications and costs of diabetes can be reduced by controlling glucose and other risk factors, many persons with diabetes do not achieve good control of these factors. Data suggest that there is often a breakdown in information flow between patient and provider. Inadequate information from patients, particularly in the areas of medication adherence and associated adverse events, can lead to poorly-informed clinical decisionmaking and inadequate or unclear instructions for patients. The goal of this Computer Assisted Medication and Patient Information Interface (CAMPII) project is to develop and test a tool to improve and standardize the flow of information between patients with type 2 diabetes and providers, thereby improving treatment outcomes and reducing complications.

The research team is developing an accessible touch-screen computer interface that patients can use in a municipal hospital diabetes clinic to report medication information and adverse drug interactions, including hypoglycemia. The patient information interface will obtain complete and accurate information from patients so that providers can make informed therapeutic decisions for patients with diabetes and its major cardiovascular risk factors.

A provider medication interface will be developed to improve the clarity and accuracy of the information received by providers and the quality of information shared with patients and other providers, with a particular focus on providing clear, detailed instructions and motivational information to patients. The provider interface will support medication management functions, including correcting incoming medication data, entry of new drug regimens, printing of medication instructions, and production of a daily medication schedule for patients.

A full interface evaluation will compare the completeness and accuracy of medication information obtained by traditional and computer-assisted methods against the reference standard of comprehensive multi-source interview by an experienced pharmacy expert. The team will also assess the accuracy, acceptability, time efficiency, and utility of the patient information interface for both providers and patients in a study population of type 2 diabetes patients with at least two visits in the prior year.

Specific Aims:
- Develop an accessible information computer interface in a municipal hospital diabetes clinic that patients can use to report medication information and adverse drug interactions. (Ongoing)
• Develop a provider medication interface to support medication management functions. (Ongoing)
• Assess the accuracy, acceptability, time efficiency, and utility of the information interface for both providers and patients. (Upcoming)

2010 Activities: By the end of 2010, a total of 79 participants (19 development and 60 pilot subjects) were enrolled to test the patient interface. Each subject was to complete a CAMPII information entry session with the touch-screen interface; a one-page medication form promoted by the American Public Health Association; and a six-page checklist style form, tailored to list the clinic’s usual medications and containing hypoglycemia questions. In addition, for the 60 pilot subjects there was an interview with a pharmacist who assessed the “truth” (whether the patient has actually been taking the medication); as well as surveys about the forms and CAMPII. Session data were collected, including process details for the CAMPII-patient interaction (e.g. duration of session, number of steps, seconds per screen, etc); along with medication, hypoglycemia, and other information entered by patients on the computer kiosk. Data were coded and entered into a database to allow comparison of the patient information sources to the “truth.” Multiple scoring methods were applied. These will inform methods for the full interface evaluation and identify additional data elements needed. Preliminary results will be reported in 2011.

Dr. Ziemer and his team are in the process of developing the provider medication interface to enable provider correction of incoming medication data, entry of new drug regimens, and printing of prescriptions and medication instructions. Providers will be able to update a daily medication schedule for the patient that includes pill pictures, medication purpose, expected benefits, and potential adverse reactions.

The planned full interface evaluation will include an assessment of the accuracy, acceptability, time efficiency, and utility of the patient information interface for both providers and patients. During 2010, the team conducted team meetings to finalize processes, forms, and interface elements for this evaluation.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Project progress is mostly on track. The project budget is significantly underspent (more than 20 percent) because of early staffing challenges related to timing of the grant start date.

Preliminary Impact and Findings: The preliminary data strongly suggest that the touch-screen CAMPII method is more sensitive for detecting and recording hypoglycemia than the medical chart or the paper forms. Scoring methods have not been finalized but some of the scores suggest that CAMPII is better than standard paper forms, but somewhat worse than the medical chart for reporting medication adherence. CAMPII is better than the chart or standard forms for identifying associated adverse events.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Project ECHO: Hepatitis C Ambulatory Care Quality Improvement in New Mexico Through Health Information Technology

**Principal Investigator:** Arora, Sanjeev, M.D.

**Organization:** University of New Mexico

**Mechanism:** PAR: HS08-270: Utilizing Health IT to Improve Health Care Quality Grant (R18)

**Grant Number:** R18 HS 018171

**Project Period:** July 2009 – June 2012

**AHRQ Funding Amount:** $1,199,696

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Hepatitis C

**Summary:** This project builds on the work of a previous Agency for Healthcare Research and Quality-funded project, Project ECHO: Extension for Community Healthcare Outcomes. Providers require access to patient-specific information to consult on cases, track patient progress, and evaluate clinical outcomes. At Project ECHO’s inception, community-based providers transmitted patient-specific information to specialists via a data management system. Data were entered and stored locally on a laptop, transmitted via a secure virtual private network (VPN), and maintained in a centralized Health Insurance Portability and Accountability Act-compliant structured query language database server to support both clinical and research activities. With Project ECHO’s rapid expansion, this type of data management proved inadequate because it presented numerous insurmountable barriers in site maintenance, VPN problems, and critical datafeed and reporting inadequacies.

To address these issues, Project ECHO will use an Internet-based clinical management system for patients undergoing treatment for hepatitis C virus (HCV). This will improve quality of care, and lead to greater knowledge sharing among health care providers for rural and underserved populations. The enhancements to the electronic disease management tool, iHealth, and the clinical management system will standardize data collection, provide practice support, create a central data repository, and allow authorized personnel to view individual patient records. The iHealth tool will be accessed as a Web portal, the central identity for the HCV program, providing a single-access point for its resources. The portal includes search tools that program personnel can use to extract data for monitoring data quality, profiling, quality improvement, and research. Laboratory data from TriCore Reference Laboratories (TriCore) will be uploaded automatically into patients’ electronic health records.

The underlying iHealth architecture supports effective management of patient data across multiple provider organizations. The Web portals for patients will provide educational links, and allow patients to see their summary reports, facilitating better communication with their providers. The provider portal can be used to coordinate training activities and provide the tools for HCV treatment. These patient needs will be assessed and determined via patient focus groups.

**Specific Aims:**

- Develop a disease management tool that will standardize data collection, provide practice support,
create a central data repository, and allow authorized personnel to view individual patient records. (Ongoing)

- Develop a Web portal that creates a central identity for the HCV program and provides a single-access point for its resources. Create search tools that program personnel can use to extract data for monitoring data quality, profiling, quality improvement, and research. (Ongoing)
- Develop a system that automatically uploads laboratory data from TriCore. (Ongoing)
- Promote adoption of iHealth clinical management system. (Ongoing)

**2010 Activities:** Many programming enhancements were completed including: improved screen flow with less mouse-clicking to access data; a home page dashboard to review and access common activities quickly; messaging system for e-mail, phone, and walk-ins; communication directly entered into chart and/or archived; improved readability of protocol summary and lab flow sheets; better entry of medication information with type-ahead lookup and single-click entry of information; a case presentation system to generate information for clinics easily; electronic documentation of recommendations are accessible via the patient’s flow sheet; HCV summary reports to follow treatment over time; calculation of visit schedule; display of priority medications in all the hepatitis C tabs; display of previous presentations done for the patient; ability to add or remove patients to or from a presentation; ability to freeze or unfreeze clinics; and the ability to print patient HCV reports.

Beta testing of iHealth was conducted with nine ECHO HCV community participants, representing four ECHO partner health organizations and eight clinic locations. The pilot test was followed by a focus group to capture participants’ comments on the iHealth disease management tool.

The team developed an electronic survey to query current participants of Project ECHO’s HCV Telehealth Clinic. This survey asks ECHO clinicians and their teams about their thoughts on electronic medical records, disease management tools, and access to a Web-based portal for HCV patient information. Fifty-five surveys were sent out and 40, or 72.7 percent, were completed and returned to Project ECHO.

Project ECHO’s database interface linking iHealth patients with TriCore’s master patient index has been established. Effectiveness is being evaluated on the test server.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is mostly on track and is meeting its aims on time, but funds are somewhat under-spent. This is a result of delays in fully staffing the project as well as conservation of funds in anticipation of a no-cost extension.

**Preliminary Impact and Findings:** The project does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Technology for Optimizing Population Care in a Resource-Limited Environment

**Principal Investigator:** Atlas, Steven J., M.D.
**Organization:** Massachusetts General Hospital
**Mechanism:** PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)
**Grant Number:** R18 HS 018161
**Project Period:** December 2009 – November 2012
**AHRQ Funding Amount:** $1,199,264
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Health information technology (IT) initiatives have been designed by many organizations in recent years to help provide consistent, high-quality care to everyone, thereby improving health care in the primary care setting. However, despite the increasing adoption of basic health IT capabilities, studies continue to reveal low rates of appropriate preventive screening. The project team for the study titled Technology for Optimizing Population Care in a Resource-Limited Environment (TOP-CARE) is working to design, develop, and implement a novel cancer screening intervention program. The goal of this study is to improve clinical decision support and enhance preventive cancer screening. The screening program is being integrated with electronic health record (EHR) data to assess whether clinical decision support can efficiently enhance preventive care—specifically, breast, cervical, and colorectal screening—in a primary care setting.

User feedback is considered critical to guide the successful design of the TOP-CARE system, particularly from key stakeholders, such as: 1) primary care physicians; 2) practice contact delegates; 3) patient navigators; and 4) central administrative personnel. A practice cluster randomized trial of the TOP-CARE program will provide an opportunity to assess its impact on cancer screening rates in eligible patients. Practices within the Massachusetts General Primary Care Practice Based Research Network (MGPC-PBRN) will be randomly assigned to intervention or augmented standard care. This randomized clinical trial will use tailored outreach, including letters, and practice personnel or patient navigator contact to see whether screening rates differ when outreach is linked to the patient’s needs. The control group will receive a standard of augmented care that mimics current population-level reminder systems, supplemented by the use of automation.

Using average cancer screening test completion rates for breast, cervical, colorectal, and prostate cancers, this study will demonstrate the use of a state-of-the-art approach to automated, cancer-specific patient reminders and its impact on involving clinicians in patient population management to facilitate between-visit, patient-centered cancer screening. This research is relevant to nationwide efforts to rigorously demonstrate the most effective ways to implement new IT-based delivery models. During the randomized trial, data related to the costs, preferences, and clinical and process outcomes will also be collected. While a formal cost-benefit analysis is outside the scope of this particular grant, the intention is that the data can be used in future cost analyses of the TOP-CARE study.
Specific Aims:

- Design, develop, and implement a novel cancer screening intervention program (TOP-CARE) that facilitates the identification, individualized contact, and subsequent tracking of patients overdue for screening. (Ongoing)
- Conduct a practice-randomized trial of the TOP-CARE program within the MGPC-PBRN assessing its impact on cancer screening rates in eligible patients. (Ongoing)
- Collect data prospectively throughout the randomized trial on costs, preferences, and clinical and process outcomes to inform a subsequent formal cost-benefit analysis. (Upcoming)

2010 Activities: Regarding the development of the TOP-CARE system, the project team has made substantial progress on many of the aspects of system architecture and developing TOP-CARE-specific functions. Development of the permission mechanism and security layer is 85 percent complete, the interface is 75 percent complete, and the integration of patient linkage methodology is 50 percent complete. Stakeholder input was solicited frequently throughout the design process and has proven useful in the design of a functioning interface. The development of the user interface is 50 percent complete after a fifth iteration of the design. The interaction functionalities have also been designed; features include a phone line, fax line, and e-mail account by which patients can provide information stored outside of the system. The pilot phase is planned to begin in the first quarter of 2011.

Regarding the randomized controlled trial, extensive work has been done to evaluate and improve on a new real-time process of linking a patient to a specific provider. Providers were given a list of 25 patients to review whether the real-time operational linkage algorithm was successful, with results indicating that it was. Also, letter templates have been developed for notifying patients of an overdue status for one or more cancer screening exams. These complex letters differ by cancer type and by sender, whether it is the physician, case manager, or automated control. These letters will include information about the value of cancer screening, the status of a patient’s eligible screening exams, instructions for scheduling an exam, instructions for notifying a provider or practice of inaccurate information or outside tests, and additional educational material when appropriate. The randomization of practices within the MGPC-PCRN will occur in early 2011.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The research team made significant progress this year. All project milestones are being met on time and spending is roughly on target.

Preliminary Impact and Findings: In the initial process of translating the validated algorithm into a real-time operational process, there were cases of patients being linked to a specific practice but not a specific provider. Extensive work was done in 2010 to evaluate and improve the real-time process, leading to a refined real-time operational linkage algorithm. Final implementation plans for this real-time linkage process are expected to be completed in the first or second quarter of 2011.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Improving Uptake and Use of Personal Health Records

Principal Investigator: Bates, David W. M.D., M.Sc.
Organization: Brigham and Women’s Hospital
Mechanism: PAR: HS08-270: Utilizing Health Information Technology (IT) to Improve Health Care Quality (R18)
Grant Number: R18 HS 018656
Project Period: April 2010 – March 2012
AHRQ Funding Amount: $862,047
Summary Status as of: December 2010

Target Population: Adults

Summary: Personal health records (PHRs) allow patients to participate in their health care in new ways. While studies have found a high degree of patient interest in PHRs, actual adoption rates are low and, once adopted, improvements in patient quality of care have not been well demonstrated. Previous studies focused on the satisfaction of current users, but did not fully describe how a patient decides to use a PHR. Strategies that provider organizations can use to encourage and support PHR adoption and use among patients are also not well understood by researchers.

This project takes a comprehensive approach to studying adoption of PHRs using the Diffusion of Innovation Framework developed by Everett Rogers. This framework will assist in understanding the factors that influence adoption by studying the different stages of the innovation-decision process, including the perceived attributes of the innovation (PHR), attitudes toward adoption of PHRs, and the impact of perceptions and attitudes on behavioral intentions as well as actual behaviors. The project will introduce the PHR in four selected primary care and specialty practices (two controls and two active intervention practices) to study the impact of multi-intervention strategies on uptake and continued use of the PHR. Each practice is determining their own strategies which include approaches such as patient education about the PHR provided by clinic staff, supporting patients in registering and using the PHR, and use of a computer kiosk in the waiting room for patient self-enrollment in the PHR. The investigators will assess the facilitators and barriers to adoption, implementation, and use of the PHR at the organizational and patient levels, and evaluate the impact of the intervention on adoption and usage rates. The final task is to assess the impact of the PHR on the quality of care, as measured by a patient survey on patient-centeredness and through a set of quality measures on health outcomes.

This research will contribute to knowledge of how to encourage use of PHRs and, once adopted, how to increase the impact of the PHR on quality of care.

Specific Aims:

- To introduce an intervention employing multiple strategies to improve the uptake and use of PHR in an ambulatory setting. (Ongoing)
- To evaluate individual-level and organizational-level facilitators and barriers associated with PHR adoption and implementation. (Ongoing)
- Assess the impact of the intervention on awareness, adoption rates, and use of the PHR. (Upcoming)
- Assess the impact of the interventions in improving quality of care. (Upcoming)
2010 Activities: The project initiated a six-month intervention period to improve the uptake of PHR in two intervention practices, one that provides primary care, and the other is a rheumatology specialty practice. To begin the intervention, the team conducted key informant interviews with selected providers and staff at the intervention and control practices at baseline to gather data on adoption and use of PHR and strategies for improving the uptake of PHR. These were completed at both the intervention and control practices (primary care and rheumatology) in 2010.

The intervention began in the primary care practice and is scheduled to start at the specialty rheumatology practice in early 2011. Each practice is determining its own strategies to improve the uptake of the PHR. At the primary care practice, physicians, medical assistants, and nurses are educating patients about the availability of the PHR, reception staff are educating patients about the PHR when patients make routine calls to the practice, and check-out staff are assisting patients in enrolling in the PHR. Other strategies are to hand out post card size cards describing the PHR and providing a lottery incentive to physicians and check-out staff for their efforts in enrolling patients in the PHR. The specialty practice is taking a different approach; they requested a computer in the waiting room so patients can self-enroll in the PHR because they felt their staff did not have time to assist patients in enrollment. In addition, the check-out staff at the practice is handing out the post card size cards describing the PHR to all patients at the time of check out.

Patient feedback on the decision to enroll in the PHR, and experience in enrollment and use of the PHR is being evaluated through patient surveys. The patient survey design was completed, and the first surveys have been distributed to participating patients.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Progress is on track in some respects but not others. About 65 to 80 percent of the milestones are being met, but there is a viable plan for achieving the others with minor delays. Project spending is on target.

Preliminary Impact and Findings: This project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
Health Information Technology to Support Clinical Decision Making in Obesity Care

**Principal Investigator:** Gance-Cleveland, Bonnie, Ph.D.

**Organization:** Arizona State University - Tempe Campus

**Mechanism:** PAR: HS08-270: Utilizing Health Information Technology (IT) to Improve Health Care Quality (R18)

**Grant Number:** R18 HS 018646

**Project Period:** September 2010–July 2013

**AHRQ Funding Amount:** $496,977

**Summary Status as of:** December 2010

**Target Population:** Obesity, Pediatric*

**Summary:** Domestically, the prevalence of overweight youth has nearly quadrupled in the past four decades. This dramatic increase has led to the emergence of associated comorbidities such as dyslipidemia, hypertension, type 2 diabetes, musculoskeletal disorders, respiratory conditions, and emotional problems. In addition, there are increased risks of cardiovascular disease and cancer as these youth become adults.

The American Medical Association has published recommendations and the National Association of Pediatric Nurse Practitioners has developed family-centered, culturally sensitive, clinical practice guidelines for obesity prevention among youth. However, past research suggests that guidelines rarely change clinical practice and outcomes. Health information technology (IT) may provide a mechanism to better implement these guidelines via decision support and tailored patient education materials. Research is needed to evaluate the role of this technology in the clinical setting.

HeartSmartKids™, a computer support system for clinical decisionmaking and tailoring patient education, has been developed to facilitate the translation of recommendations into practice. This study will employ a comparative-effectiveness trial to evaluate clinician decision support and tailored patient education on the implementation of the current guidelines at school based health clinics. Outcome assessments will be conducted at the provider and system levels. The research aims to eliminate health disparities for the conditions related to childhood obesity via the translation of evidence-based guidelines into practice by the providers who care for youth at risk for these obesity-related conditions.

**Specific Aims:**

- Evaluate the effectiveness of Web-based training with and without computerized clinical decision support on provider’s process and outcome behaviors related to implementing the current guidelines for prevention of obesity and related conditions. (Upcoming)

- Explore the role of health IT in the processes of system change for implementation of the guidelines for prevention of obesity and related conditions, including the facilitators, barriers, and impact of the care model on change. (Upcoming)

**2010 Activities:** During the grant’s first quarter, efforts have predominately focused on start-up activities including hiring new staff, recruiting clinics, and developing online modules. Twenty-four clinics were recruited for study participation and institutional review board protocols are being developed for each of these sites.
Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): Overall the project is making progress and meeting most of its aims and milestones. There is a viable plan for achieving other milestones. The project is slightly under-spent due to late distribution of funds.

Preliminary Impact and Findings: This project has no preliminary findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Implementation and Use

* AHRQ Priority Population
The Medication Metronome Project

Principal Investigator: Grant, Richard, M.P.H., M.D.
Organization: Massachusetts General Hospital
Mechanism: PAR: HS08-270: Utilizing Health Information Technology (IT) to Improve Health Care Quality (R18)
Grant Number: R18 HS 018648
Project Period: September 2010–July 2013
AHRQ Funding Amount: $383,049
Summary Status as of: December 2010

Target Population: Chronic Care*, Diabetes, Hypertension

Summary: One goal of primary care is to reduce the morbidity and mortality of chronic diseases such as hypertension, type 2 diabetes, and hyperlipidemia. However, national and local data indicate that the U.S. health care system is falling significantly short of evidence-based goals for these three conditions, both in terms of risk-factor control and in monitoring adverse drug events. Novel uses of health information technology (IT) are needed to support more effective medication management for chronic diseases in the primary care setting.

The Medication Metronome Project is testing a model of chronic disease medication management in which specific clinical actions, such as the decision to initiate or adjust medications, are performed independently of the office visit. The study will implement a randomized controlled trial using an existing electronic health record (EHR) at Massachusetts General Hospital (MGH) to evaluate the value of an IT system that supports between-visit medication safety monitoring and dose adjustment. This “Medication Metronome” will be designed to enable providers to schedule future laboratory tests related to a specific set of medications for glycemic, cholesterol, and blood pressure management. As these lab test dates become due, the Medication Metronome system will remind patients via letter and inform providers when the tests are “missing.” The goal of this intervention is to implement an efficient, visit-independent system to ensure that patients are rapidly and safely brought to evidence-based treatment goals and to prevent delays in planned laboratory monitoring.

The goal of the intervention is to facilitate an iterative process of medication adjustments so that risk-factor control is not dependent upon face-to-face office visits. The broader goal is to foster greater patient-physician connectedness by combining independent medication management with more productive visit-based care. This research is relevant to nationwide efforts to demonstrate the most effective ways to implement new IT-based delivery models that expand care beyond the traditional clinic visit.

Specific Aims:
• Develop the Medication Metronome system. (Ongoing)
• Conduct a randomized controlled trial of the Medication Metronome system. (Upcoming)
• Evaluate the impact of the Medication Metronome visit-independent care model on both the frequency and content of office-based visits. (Upcoming)

2010 Activities: The project began in September 2010. The primary focus of activity during the first
quarter of the project was on administrative and personnel activities. The project team was assembled and includes health IT developers within the MGH Laboratory of Computer Science (LCS), directed by Dr. Henry Chueh, Co-Investigator and LCS Director. A kick-off meeting attended by the entire project team was conducted in November 2010 to discuss an overview of the project. A monthly newsletter, sent via e-mail, has also been initiated as a mechanism to chart progress and keep all members informed.

The health IT development process began with the presentation of the conceptual framework to the primary care external advisory board on November 19, 2010. This board represents all 12 primary care practices within the Practice-Based Research Network, which is a group of ambulatory practices devoted principally to the primary care of patients. Feedback from this meeting informed use cases, default settings, and user-interface development. In addition, the project team conducted three one-on-one meetings with clinicians to establish workflow for using the Medication Metronome interface and to identify additional use cases. The iterative process of sharing information between developers and users will continue until a final product is created.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is completely on track to meet its aims and milestones. The project is currently under budget but expenses are expected to increase as system development continues and testing begins.

Preliminary Impact and Findings: There are no project findings at this time.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Implementation and Use

* AHRQ Priority Population
Information Technology Implementation by Cognitive Engineering of Organizational Routines

**Principal Investigator:** Green, Lee A. M.D., M.P.H.
**Organization:** University of Michigan at Ann Arbor
**Mechanism:** RFA: HS08-270: Utilizing Health IT to Improve Health Care Quality Grant (R18)
**Grant Number:** R18 HS 018170
**Project Period:** December 2009 – November 2012
**AHRQ Funding Amount:** $1,199,139
**Summary Status as of:** December 2010

**Target Population:** Medically Underserved, Safety Net, Uninsured

**Summary:** Successful implementation of health information technology (IT) systems requires substantial attention to work flow processes. This project closely examines the change process that must occur for successful adoption of health IT and how to best reengineer workflows. The Department of Family Medicine at the University of Michigan is partnering with the Michigan Primary Care Association to identify three Federally Qualified Health Centers (FQHCs) to implement Cielo Clinic™, a commercial clinical quality management system developed by family medicine physicians at the University of Michigan. The use of the Cielo Clinic™ will be tailored to each participating FQHC’s interest and priorities. Through an iterative process, each clinic will choose the screening, prevention, chronic disease management, and outreach components of the Cielo Clinic™ software that best fit their quality improvement priorities.

This project closely examines the change process that must occur for successful adoption of the quality management system using an advanced set of tools called cognitive task analysis to guide the implementation and reengineering work. Each practice included has an existing electronic health record (EHR), and practices vary in their use of different functional components of their EHR. Implementation will focus on training the site staff to work as teams in understanding and modifying organizational routines using the Cielo Clinic™. Clinics will work iteratively on implementation until they achieve success, or until several Plan-Do-Study-Act cycles without progress make it clear that implementation will not succeed. Practices will be evaluated to determine whether the Cielo Clinic™ clinical system increases adherence to evidence-based practice and whether cognitive task analysis-guided implementation is advantageous to the health centers. The study will use a mixed-methods stepped-wedge research and evaluation design to allow analysis of data across time within sites and to make across-site comparisons. The project will collect qualitative data on the implementation process, including the barriers and facilitators encountered, which will provide information to health care leaders on how to best implement new technology in the ambulatory safety net environment.

**Specific Aims:**
- Identify the barriers and facilitators to implementing clinical quality management systems in safety net ambulatory care settings. (Ongoing)
- Measure the impact of using cognitive engineering tools during implementation of a clinical quality management system (Cielo Clinic™). (Upcoming)
2010 Activities: Two of the three planned FQHCs began their planned project activities in 2010. The project team completed cognitive task analysis interviews at each of these health centers with the goals of understanding organizational operations such as roles and responsibilities, current communication mechanisms, and areas of comfort and discomfort with organizational change. This information was used by the research team to develop an initial map of the health center’s current organizational routines that may be affected by implementation of Cielo Clinic™. At both of these sites, Cielo Clinic™ was installed. Further, the research team began to work with each clinic to identify the priority areas for quality improvement and the quality metrics they may use to measure progress. The third clinic slated for implementation of the Cielo Clinic™ and cognitive task analysis was in the final stages of review and identification at the conclusion of 2010 and will begin implementation in 2011.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project team is on track with all project milestones, and the budget spending is on target.

Preliminary Impact and Findings: The results of cognitive task analysis interviews were presented to the clinic leadership. The process of cognitive task analysis was successful in discovering areas of reliance on tacit knowledge that have potential for significant implications for implementing health IT. For example, the cognitive task analysis revealed differing assumptions and expectations among providers who believed they were in agreement about guideline implementation.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Automating Assessment of Obesity Care Quality

Principal Investigator: Hazlehurst, Brian L., M.A., Ph.D.
Organization: Kaiser Foundation Research Institute
Mechanism: PAR: HS08-270: Utilizing Health IT to Improve Health Care Quality Grant (R18)
Grant Number: R18 HS 018157
Project Period: December 2009 – May 2011
AHRQ Funding Amount: $1,194,761
Summary Status as of: December 2010

Target Population: Adults, Chronic Care*, Obesity

Summary: Obesity and its public health effects are an increasing burden on the health care system. This project proposes to develop, implement, and evaluate a routine, automated method to assess outpatient obesity care quality using measures from comprehensive electronic medical record (EMR) data based upon the National Heart, Lung, and Blood Institute (NHLBI) obesity care guidelines.

The study team will use reasons for visit, orders, referrals, diagnosis codes, laboratory test values, and text clinical notes pertaining to weight loss counseling and other obesity intervention efforts to investigate associations between obesity care delivery steps and clinical outcomes known or suspected to be accelerated by obesity. Percent change in body weight was selected as the primary outcome measure.

Retrospective EMR data from both a midsized health maintenance organization and a consortium of Federally Qualified Health Centers will be used to evaluate the association between obesity guideline adherence and clinical outcomes. The project will use Kaiser Permanente’s Certification Commission for Health Information Technology-certified Epic-based EMR HealthConnect and Oregon Community Health Information Network’s Epic-based EMR EpicCare. Information from both structured and free-text fields will be used. Free-text fields will be automatically coded using natural language processing computer software. Data produced under the automated method of quality measurement will be compared to medical record reviews performed by abstractors in order to assess the validity of the automated system.

The automated system will be applied to two diverse patient populations totaling more than 350,000 adults to determine: 1) the proportion of overweight or obese patients who are receiving advice, counseling, weight loss program referral, medication prescription, and other care recommended by the guidelines; 2) correlates of overweight and obesity diagnosis and treatment guideline adherence including patient characteristics, comorbidity status, provider characteristics, and health system characteristics; and 3) changes in health status as a function of guideline adherence for obese patients.

Specific Aims:
• Develop obesity care quality measures based on updated NHLBI guidelines to evaluate obesity care performance in primary care. (Achieved)
• Use comprehensive EMR data to develop and validate an automated (generalizable and scalable) method for applying the measures identified in the first aim. (Ongoing)
• Apply the method developed in second aim to assess ambulatory obesity care quality in two distinct
health plans representing diverse patient populations and care practices. **(Ongoing)**

- Evaluate the association between measures of obesity guideline adherence to recommended obesity care processes and clinical outcomes and provider characteristics. **(Upcoming)**

**2010 Activities:** The study team developed a working draft of the Obesity Care Quality (OCQ) Measure Set that defines the following:

- Study population, including reasons for exclusion.
- Nine distinct measures of obesity care quality, including criteria for qualification and measurement.
- Risk factors that will be assessed to enable measurement of care for those at heightened risk for adverse health consequences of obesity.

Although the working draft of the OCQ Measure Set will be revised as needed, the associated aim was considered achieved. The team updated their data extraction process and, with a working draft of the OCQ Measure Set developed, have begun to identify the content-specific rules and codes required to identify the relevant clinical events, such as the order codes used at each site, that indicate “obesity counseling.”

Progress was made in identifying the data necessary to assess ambulatory obesity care quality in the two health systems. Summary analyses to understand numbers of patients meeting basic eligibility criteria were created and the project has refined and generalized the measurement methodology utilized in a previous Agency for Healthcare Research and Quality-funded study.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is completely on track with all milestones being met and progressing on schedule. The overall budget is somewhat underspent, due to a slower than expected startup. It is anticipated to be on track in the upcoming year.

**Preliminary Impact and Findings:** The project does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
My MediHealth: A Paradigm for Children-Centered Medication Management

Principal Investigator: Johnson, Kevin B., M.D., M.S.
Organization: Vanderbilt University
Mechanism: PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)
Grant Number: R18 HS 018168
Project Period: December 2009 – November 2012
AHRQ Funding Amount: $1,200,000
Summary Status as of: December 2010

Target Population: Asthma, Chronic Care*, Medicaid, Pediatric*, Teenagers

Summary: Medication management of children with chronic conditions is complex because of the need to tailor dosages based on a child’s age and development, and because of the potential for frequent handoffs between caregivers. To improve care of children with chronic disease, a team at Vanderbilt University Medical Center in Tennessee, led by Dr. Kevin Johnson, is working to address medication management in the pediatric population through further development of MyMediHealth, a mobile personal health application specifically for medication management which is built to interface and share information with a personal health record (PHR). The overarching goal of the MyMediHealth project is to investigate ways in which personal health records and supported applications can improve the safety and quality of medication delivery.

The study will evaluate the impact of use of MyMediHealth on medication adherence in children ages 12 to 18 with asthma in the Vanderbilt Primary Care Clinic. The control group will receive education about the personal health record (PHR) only, while the intervention group will receive education and training about the use of the PHR and MyMediHealth. MyMediHealth will provide medication information and reminders to children by cell phone or pager, with additional support from a Web-based patient portal (access controlled by parent). Patients will be able to create medication schedules, schedule alerts to mobile devices, and examine medication administration information. The patient portal will provide laboratory results, relevant medical literature, e-mail for direct communication with providers, and direct appointment scheduling.

The project will develop a knowledgebase of common pediatric asthma medications that will be incorporated into MyMediHealth to evaluate the impact of MyMediHealth on medication adherence. Study measures include medication adherence, effect on family dynamics, disease control, and impact on caregivers outside the home (i.e., school caregivers and health care providers). The results of this study will have important implications for understanding how to further patient-centered care and medication adherence in the pediatric population. Some findings may also be applicable to chronic disease management in the adult population.

Specific Aims:
- Develop an information and scheduling knowledgebase for common pediatric asthma medications (including allergy medications). (Achieved)
• Adapt MyMediHealth in its current prototype form to patients diagnosed with asthma. (Ongoing)
• Integrate MyMediHealth into the Vanderbilt patient portal to support medication scheduling and the creation of medication reminders. (Unlikely to achieve)
• Evaluate the impact of MyMediHealth on medication adherence. (Ongoing)

**2010 Activities:** In 2010, the team completed the asthma medications knowledgebase, and nearly completed the adaptation of the MyMediHealth prototype. The remaining work on the prototype involves making small modifications and refinements. For example, the team is adding photos of medications to the database, as well as functionality for users to add photos of their own. In addition, they are adapting MyMediHealth for Spanish speakers and have continued to work on improving the user interface. On the technical side, they have been developing the natural language processing to enable an automatic categorization of text responses from patients. The project team also met with the senior management at Vanderbilt about the interface between MyMediHealth and the MyHealthAtVanderbilt PHR. Due to privacy and information-sharing concerns, the tool will not directly interface with MyHealthAtVanderbilt at this time; therefore the third project aim is unlikely to be achieved. However, it will interface with other Web-based PHRs such as Google Health.

MyMediHealth was shared with a patient advocacy group at one hospital, and the team has plans to share it with the children’s hospital in spring 2011. MyMediHealth was also shared with the Teen-Medi group which includes teenagers, providers, and others (school nurses, teachers, etc.). The teenagers use the tool for two weeks before the meetings to gain firsthand knowledge. They then share the ways they used MyMediHealth and their thoughts about it as a tool to manage health. The initial anecdotal feedback so far has been positive.

The evaluation of MyMediHealth began in 2010, and the team was successful in reaching the goal of recruiting 50 participants for the Ecological Momentary Assessment (EMA) Tool. The EMA Tool consists of an oral interview and a Web-based survey that asks about daily behaviors, regular dosing time, why that time is chosen, and any variation in dosing time. The EMA assessment is paired with tracking medication adherence using the MyMediHealth tool. Participants use the tracking tool embedded within MyMediHealth to measure when they use their inhalers over a 30-day period and then take an exit online survey. The tracking tool both reminds patients to take their medication and tracks patient responses to these reminders.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Project progress is mostly on track. The team is meeting about 80 to 99 percent of the milestones and activities are generally on time. Budget funds are somewhat underspent, mainly due to the fact the project had a later start date, thus spending is on target relative to activities completed at this time.

**Preliminary Impact and Findings:** The project does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Facilitators and Barriers to Adoption of a Successful Urban Telemedicine Model

Principal Investigator: McConnochie, Kenneth, M.D., M.P.H.
Organization: University of Rochester
Mechanism: PAR: HS08-270: Utilizing Health Information Technology (IT) to Improve Health Care Quality (R18)
Grant Number: R18 HS 018912
Project Period: September 2010 – August 2013
AHRQ Funding Amount: $418,029
Summary Status as of: December 2010

Target Population: Inner City*, Pediatric*

Summary: Since its inception in 2001, the Health-e-Access telemedicine network (HeA) in urban Rochester, NY has been used to manage acute childhood illness efficiently. Three telemedicine service models have evolved from HeA’s ability to bring care directly to children, instead of children having to travel to see their care provider. The three models focus on child care, school care, and after-hours neighborhood care. These models give families in Rochester several options for care of children with acute illnesses. The researchers have hypothesized that families will embrace the use of telemedicine via these new service models once they recognize their clear advantages over traditional care models, such as the use of emergency department care.

The goal of this project is to use HeA to replace inconvenient, inefficient, and expensive traditional models of care with convenient, high-quality, and less-expensive models. It aims to deploy and solidify sustainable business models for each of the three telemedicine service models in four inner-city zipcode areas. Additionally, it will identify facilitators and barriers of implementation, monitor the impact on utilization patterns, and create and disseminate an implementation and sustainability toolkit. The research team will use both qualitative and quantitative methods of research, including key informant unstructured interviews, semi-structured interviews, and statistical analysis of utilization patterns. Identification of facilitators and barriers to replication of an existing telemedicine model may promote widespread replication in other communities and for a broader range of patients.

Specific Aims:

• Achieve substantial deployment and solidify sustainable business models for each of the three urban telemedicine service models. (Ongoing)
• Identify facilitators and barriers to dissemination of the three telemedicine service models. (Ongoing)
• Monitor impact of the HeA models on utilization patterns. (Upcoming)
• Create and disseminate an implementation and sustainability toolkit. (Upcoming)

2010 Activities: This first quarter focused on key informant interviews to assess barriers to and facilitators of telemedicine implementation. Key informants include parents, nurses who manage calls, telemedicine assistants who enable visits, providers, site staff, and leadership from various collaborating organizations.
Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is meeting most milestones on time. The budget is somewhat under spent due to major upcoming milestones.

Preliminary Impact and Findings: The preliminary information gathered from key informant interviews with nurses indicated that the nurses believe that telemedicine is valuable and would use it for their own children. Additionally, the researchers found that the call center records the rate of dropped calls, the number of times a caller hangs up while on hold, and noted that they had increased. The interviews revealed that the process of explaining telemedicine requires significant time because most parents are not familiar with the concept. This causes lengthy on-hold times leading to the high dropped call rate. The team therefore developed a script to help nurses explain telemedicine to parents more efficiently.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Implementation and Use

* AHRQ Priority Population
Online Counseling to Enable Lifestyle-Focused Obesity Treatment in Primary Care

Principal Investigator: McTigue, Kathleen M., M.S., M.D., M.P.H.
Organization: University of Pittsburgh
Mechanism: PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)
Grant Number: R18 HS 018155
Project Period: October 2009 – September 2012
AHRQ Funding Amount: $1,199,824
Summary Status as of: December 2010

Target Population: Adults, Obesity

Summary: Obesity is a major cause of cardiovascular disease. More than half of the United States population is estimated to be overweight and an estimated 31 percent are obese. While the United States Preventive Services Task Force (USPSTF) recommends that clinicians screen all adult patients for obesity and offer intensive counseling and behavioral interventions to promote sustained weight loss for those who are obese, there are multiple barriers to intensive lifestyle counseling and the recommendation has not been widely implemented.

This study looks at using health information technology to enable clinical lifestyle counseling on weight loss with the goal of integrating lifestyle issues into routine preventive medicine. The research examines the effectiveness of delivering an online version of the Diabetes Prevention Program (DPP) lifestyle intervention in a primary care setting. Recruitment is targeted to a diverse group of participants in terms of gender, body mass index, comorbidity status, and racial, ethnic mix. The coaching strategies incorporate physician feedback. Assessment of the intervention looks at multiple outcomes, including change in weight, waist circumference, physical activity, quality of life, and intervention cost-effectiveness.

The study seeks to address the key problem of how to implement USPSTF obesity screening and treatment recommendations in a cost-effective manner and help translate well-established methods into a clinical setting. Furthermore, the use of technology may provide a more patient-centered approach to clinical obesity management.

Specific Aims:
• Use Internet technology to translate an evidence-based lifestyle intervention into diverse primary care settings in order to facilitate the delivery of evidence-based preventive counseling. (Ongoing)
• Examine how different strategies of delivering a DPP-based online lifestyle intervention differ in weight loss and cost-effectiveness. (Ongoing)

2010 Activities: Study participant recruitment began and included hiring and training staff, ordering supplies, developing and printing advertising materials, securing space for orientation sessions, and creating an electronic referral form. The rate of general recruitment is on target and the recruitment of minorities in particular has exceeded the target of 15 percent. Development of the study database was completed and the database was implemented, as was a new protocol for the virtual lifestyle management...
online lifestyle coaching strategy. The project team continues to meet with the software vendor on a regular basis to resolve technical issues, identify potential software enhancements, and increase quality assurance mechanisms. One enhancement made in 2010 was to make archiving of the coaches’ notes more user-friendly, which has proven extremely useful when one coach is on vacation and another coach is filling in. The final participant sites were added in October, bringing the number of participating sites to six. The lifestyle coaches have begun to conduct face-to-face “outcome visits” with participants and data from those visits will soon be available for preliminary analysis.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Dr. McTigue reports that aims and milestones are mostly on track. The budget is currently underspent but the rate of spending will increase with ongoing data collection and upcoming data analysis.

**Preliminary Impact and Findings:** There are no findings to report as data collection is still in progress. Informal feedback from physicians at the participating sites suggests there is interest in access to an online weight-maintenance intervention.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
# Bringing High-Performing Systems to Small Practices

**Principal Investigator:** Parsons, Amanda, M.Sc., M.D.

**Organization:** New York City Health/Mental Hygiene

**Mechanism:** PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)

**Grant Number:** R18 HS 018275

**Project Period:** December 2009 – November 2012

**AHRQ Funding Amount:** $1,199,853

**Summary Status as of:** December 2010

**Target Population:** Adults, Inner City*, Medicaid, Medically Underserved, Safety Net

**Summary:** To date, there is limited evidence on the ability of small community health care providers to improve quality of care through the use of electronic health records (EHRs), and limited data on the impact of financial incentives for quality improvement on small providers. Investments in health information technology (IT) are being made to improve quality of care and, while there is evidence of improved quality in integrated delivery systems, such as the Kaiser Permanente system, there is less evidence of the effectiveness of health IT on patient outcomes in nonintegrated health systems.

This study will provide information on the effects that supportive EHR implementation, clinical decision support (CDS) systems, and pay-for-quality improvements have on small community providers’ cardiovascular health outcomes. The New York City Primary Care Information Project (PCIP) is comparing the implementation of EHRs at 60 small ambulatory primary care practices that are not part of an integrated delivery system throughout New York City to 60 similar practices in the area that do not have an EHR. The project targets EHR implementation throughout New York City, with a focus on some of the poorest neighborhoods. The majority of practices are using Certification Commission Heath Information Technology-certified eClinical Works.

The study will evaluate the impact of an EHR implemented with the support of technical assistance, and added tools, including integrated registry systems and CDS, on improvements in quality of care as compared to practices that do not have an EHR or the aforementioned support programs. The primary goal is to determine whether practices that have supportive EHR implementation provide higher-quality care and experience a more rapid rate of improvement of their quality measures than practices that do not have an EHR. A secondary goal is to determine the characteristics, if any, that indicate supported EHR practices are atypical, or have any consistently different characteristics, as compared to other small independent practices. At a more nuanced level, the research will assess the attributable impact of various interventions on changes in four cardiovascular health outcomes at small practices that provide adult primary care. This will provide specific information on the value of various types of support on the rate of improvement on cardiovascular quality measures.

**Specific Aims:**

- Determine whether practices that participated in the PCIP program experienced a more rapid rate of improvement on their quality measures than practices that did not participate. *(Ongoing)*
• Determine if PCIP-participating practices are atypical in comparison to other small independent practices in New York City. **(Ongoing)**

• Assess the attributable impact of each intervention: adoption of EHR, CDS, and pilot pay-for-quality program. **(Upcoming)**

**2010 Activities:** The project finalized the group of PCIP providers that is the comparison group for the active intervention practices that are receiving supportive EHR implementation. EHR adoption among small clinics in New York has moved rapidly since the writing of the grant, and there are fewer practices that have not begun EHR implementation. As a result, the project is shifting the definition of the “control” practices from non-EHR adopters to a subset of practices that are late adopters of the EHR. For the later adopters, 58 practices were recruited, representing a total of 134 providers. Similar to the early adopters, the majority of practices that were recruited as the late adoption group are solo or two-person practices. The project has decided to define early adopters as those that adopted an EHR prior to January 2009. Late adopters are those that adopted between January 2009 and March 2010.

The team developed and successfully implemented a baseline provider survey tool on their experiences with quality measurement, reporting, and incentives. A separate survey was distributed by PCIP as part of the overall regional extension center activities to assess the practice’s orientation and experience in completing tasks such as documentation and ordering. Practice characteristics, such as number of providers, ancillary staff, and patient demographics, are collected either through the practice’s application or through the chart review process.

To assess the impact of the interventions on quality, a number of quality measures will be collected through chart review. The team developed a form, database, and instruction set to collect the clinical data elements from paper charts that can be used to calculate the same quality measures as those calculated through the EHR. Chart review will continue through 2011. The study design was updated to include two time points prior to EHR adoption for the early EHR adopters for contemporaneous comparison with the later EHR adopters. This is needed to assess trends in quality measurement prior to EHR adoption. The two trends (pre-EHR vs. post-EHR) will enable the research team to determine which factors may be associated with changes in the trends in practice performance on quality measures. The team is also seeking additional data sources external to the PCIP program (e.g., health plan claims), to compare performance on quality metrics in these practices.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Progress is completely on track. The team is on time on all tasks and the budget spending is on track.

**Preliminary Impact and Findings:** Data describing the characteristics of the early and late adopters is under internal review and will be submitted to the American Journal of Public Health. Preliminary analyses in 2010 for a few selected items focused on providers who received incentive payments and their perceptions of the payments. These analyses were used to gauge the motivation of providers in earning incentives tied to quality performance.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

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* AHRQ Priority Population
Self-Management & Reminders with Technology:
SMART Appraisal of an Integrated Personal Health Record

**Principal Investigator:** Roberts, Mark Stenius, M.P.P., M.D.
**Organization:** University of Pittsburgh
**Mechanism:** PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)
**Grant Number:** R18 HS 018167
**Project Period:** October 2009 – September 2012
**AHRQ Funding Amount:** $1,183,337
**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Heart Disease

**Summary:** The complexity of patients’ medical conditions is increasing, making preventive care and disease management more difficult. There is growing interest in integrating personal health records (PHRs) with providers’ electronic medical records (EMRs) to assist patient self-management and improve care for complex diseases. However, studies that evaluate the impact of PHRs on care outcomes are few.

This project seeks to improve health care outcomes in patients who have or are at high risk for developing cardiovascular disease (CVD) by promoting patient self-management at more than 80 primary care practices, including small and large practices. Major activities include development of a patient-specific, active and interactive component to an existing electronic PHR; a randomized controlled trial to determine the effectiveness of passive and active PHR systems for improving adherence and clinical outcomes; and cataloging the facilitators and barriers to PHR implementation and use. To accomplish the first task, a user group was assembled to determine which features of an active PHR are considered to be most acceptable and useful. To facilitate the second task, target enrollment for the trial has been set at 1,200 patients with complex chronic disease leading to increased cardiovascular risk. This target allows for a 20 percent drop-out rate to arrive at a sample of 1,000 participants to be randomized to a passive PHR (n = 500) or an active PHR (n = 500) at four sites where the PHR currently is installed and in use. All participants will be surveyed using the PHR, along with nurses and physicians at the study sites. Focus groups will also be conducted among PHR participants, nurses, and physicians to determine the barriers to and facilitators of PHR use. Outcomes to be assessed include improvement in control of risk factors, frequency of compliance with testing guidelines, and clinical outcomes.

The PHR for this project, Health Trak, interfaces with EpiCare Electronic Health Record, the organization’s Certification Commission for Health Information Technology-certified EMR system. The passive PHR allows patients to view portions of their EMR—including problem lists, medication lists, and test results—to communicate electronically with their physician’s office and to track values of home-monitored blood pressure and glucose. This is the standard form of a PHR for many EMRs. The active PHR has the features of the passive PHR but also electronically advises patients to check a secure Web site when disease self-management tasks or preventive services are necessary. This project will help determine if the use of an active patient self-management version of an existing PHR can reduce cardiovascular risk factors.
Specific Aims:

- Develop a patient-specific, active and interactive component to an existing electronic PHR for patients with complex illnesses and conditions that contribute to the development of cardiovascular disease. (Achieved)

- Conduct a randomized controlled trial of the effectiveness of passive and active PHR systems for improving adherence and clinical outcomes of these patients in an ambulatory environment. (Ongoing)

- Enumerate and catalog the barriers and facilitators to implementation and use of an electronic PHR among providers and patients in an ambulatory setting. (Upcoming)

2010 Activities: Patient user groups and focus groups were conducted to inform the development of the interactive component of the PHR, which was activated in 2010 in both EpicCare and Health Trak. E-mail and text alerts are being transmitted to the patients in the intervention group based on the specific cardiovascular health maintenance activities for which the patient is due. Study recruitment for the randomized controlled trial went live June 2010. In the first 6 months of recruitment, over 400 patients were enrolled. Although the rate of recruitment was slightly lower than the desired levels, active and passive recruitment strategies continue to be utilized. To help increase recruitment the project team and providers met one-on-one to answer their questions and encourage participation. The study team anticipates reaching the enrollment target by spring 2011. The task of writing the EMR reports has also been initiated. These reports will be used to extract the EMR data such as demographics, PHR usage statistics, and outcome variables.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): No reports were submitted to the AHRQ Research Reporting System in 2010. However, Dr. Roberts provided information that, as of June 2010, the project was underspent due to hiring challenges and because the data center had not yet been invoiced.

Preliminary Impact and Findings: This project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation

* AHRQ Priority Population
A Risk Based Approach to Improving Management of Chronic Kidney Disease

Principal Investigator: Sequist, Thomas D., M.D., M.P.H.
Organization: Brigham and Women’s Hospital
Mechanism: RFA: HS08-270: Utilizing Health IT to Improve Health Care Quality Grant (R18)
Grant Number: R18 HS 018226
Project Period: December 2009 – November 2012
AHRQ Funding Amount: $1,127,741
Summary Status as of: December 2010

Target Population: Chronic Care*, Kidney Disease

Summary: Chronic kidney disease (CKD), though common, is often unrecognized by primary care physicians. Better health outcomes can often be obtained with better disease identification and management. However, there has been limited review of the outcomes of comprehensive disease management of CKD and no studies of the impact of patient education on this condition. Harvard Vanguard Medical Associates, an integrated delivery system in Massachusetts, is conducting a randomized controlled study on the care of patients with stage 3 CKD in the primary care setting. The study implements a disease management program at 14 health centers with improved clinical decision support for physicians and self-management support for patients.

During the first phase of the project, one health center was selected for pilot testing the intervention components including the clinical decision support and patient support materials. The randomized controlled trial will be conducted over 18 months, and will include approximately 170 providers. The physicians in the intervention group will receive patient-specific alerts at the time of office visits, while the control group physicians will not.

The impact of combining electronic alerts, a disease registry, and a patient education program on adherence to best treatment practices, will be measured by several indicators such as problem lists and encounter codes. Assessment of the appropriate documented problem list and encounter codes will be used to measure primary care physician awareness of CKD. Providers will also be queried on how the use of the intervention tools impacted their attitude towards CKD management and the use of electronic reminder systems. Data for the study will be taken for patients with CKD from the electronic records in Harvard Vanguard’s 2007 EpicCare electronic health record (EHR), which is certified by the Certification Commission for Healthcare Information Technology. The data will provide information on best practices in the treatment of CKD in the primary care setting through the use of EHRs, advanced decision support, and patient outreach and education.

Specific Aims:

- Use computerized clinical information systems to identify baseline predictors of appropriate evaluation and treatment of stages 3 and 4 chronic kidney disease, including patient characteristics and nephrology involvement. (Achieved)
• Assess whether quality of care for stage 3 chronic kidney disease can be substantially improved over 18 months by: a) point of care electronic alerts to primary care physicians recommending risk-appropriate care, and b) quarterly mailings to patients providing self-management support materials, including tailored recommendations based on personalized data from an electronic disease registry. (Ongoing)

• Assess the relationship between utilization of the intervention components and primary care physician attitudes towards both chronic kidney disease management and electronic reminder systems. (Upcoming)

2010 Activities: In June a pilot of the intervention was initiated. The pilot included physician alerts and the mailing of patient support materials. For providers, the pilot randomized five physicians to receive electronic alerts. Prior to “turning on” the electronic alerts, the physicians were surveyed on their perceptions of electronic reminder systems, patient self-management support, and physician preparedness for managing CKD. A clinical database was constructed, which populated information fields within personalized letters to be included in the patient mailings. The grantee team also created a baseline and followup survey. The randomized controlled clinical trial is scheduled to begin early in 2011.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is meeting 80 to 99 percent of the planned milestones on time. The project spending to date is somewhat under budget due to delayed timing of patient mailings.

Preliminary Impact and Findings: In the first phase of research the team analyzed the predictors of quality of CKD care. The findings from this analysis were that among 11,760 patients treated by 166 primary care providers (PCPs) across 15 clinics, 66 percent had hypertension and 29 percent had diabetes. PCP awareness of CKD was low at 24 percent, and only 10 percent of patients were co-managed with nephrologists. Most patients were not receiving appropriate CKD care, and both PCP awareness and nephrology co-management were consistently associated with improved effectiveness and drug safety.

The completed pilot intervention provided several insights into implementing the larger scale intervention. These included: 1) the volume of nephrology referrals generated through electronic alerts; 2) the patient reactions to educational mailing materials; and 3) the provider reactions to the electronic alerts. These findings will inform the full randomized trial scheduled to begin in April 2011. The pilot intervention practices increased the number of nephrology referrals 15 fold from the control practices. Due to the increase in nephrology referrals, the research team decided to roll out the intervention in a staged manner across the 14 health centers. By enrolling two health centers per month, the expectation is that the volume of referrals generated through the intervention will be more manageable for the available nephrologists.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Virtual Continuity and its Impact on Complex Hospitalized Patients’ Care

**Principal Investigator:** Smith, Kenneth J., M.D., M.S.  
**Organization:** University of Pittsburgh at Pittsburgh  
**Mechanism:** PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)  
**Grant Number:** R18 HS 018151  
**Project Period:** October 2009 – September 2012  
**AHRQ Funding Amount:** $1,193,052  
**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Hospital care processes have changed dramatically over the last 10 to 15 years. Previously, hospitalized patients were cared for by their primary care physician (PCP), facilitating continuity of care between inpatient and ambulatory care settings. Now, many hospitalized patients are cared for by hospital staff physicians and are returned to their PCPs’ care upon discharge. Without dedicated information transfer processes, this stratification of care can lead to information loss and medical error. Heightened communication with and involvement by the PCP in the care of hospitalized patients should decrease medication errors, diagnostic errors, and follow up errors, thereby improving medical care quality and safety as well as patient and physician satisfaction.

This project, started in October 2009, will enhance MedTrak, the University of Pittsburgh Medical Center (UPMC) electronic physician communication tool, with an initiative called Virtual Continuity. Virtual Continuity allows PCPs to follow their hospitalized patients electronically and participate more directly in their care through the use of e-mails that are triggered by clinical events with embedded links to electronic medical record (EMR) data and communication portals, medication lists electronically delivered at admission and discharge, and immediate notification of discharge with pertinent clinical details. The project is using the Cerner PowerChart EMR system, a Certification Commission for Health Information Technology-certified product.

To evaluate the impact of Virtual Continuity, a pre-post study will compare the frequency of discharge medication errors before and after initiation of the Virtual Continuity intervention. Additional evaluation measures include PCPs’ frequency and timeliness of receiving information, PCPs’ perception of information exchange adequacy and usefulness, patients’ satisfaction with care and the information they receive, and rates of rehospitalization, post-discharge emergency department visits, and PCP followup visits. The information technology cost of implementing and maintaining the Virtual Continuity intervention will also be assessed.

**Specific Aims:**

- Augment the present system of PCP notification through the development and use of electronic EMR links to allow virtual continuity for the PCP. (Ongoing)
• Measure differences in patient care safety and quality between PCPs receiving virtual continuity versus usual communication in a pre-post study. (Upcoming)
• Evaluate the impact of virtual continuity. (Upcoming)

2010 Activities: A steering committee and a working group consisting of project investigators and UPMC Information Services Department personnel continued to meet regularly to develop procedures that will allow enhanced hospital to PCP communication to occur. Planning of specific processes to implement and maintain the virtual continuity communication intervention is ongoing.

Physicians who serve as PCPs and are employed by the University of Pittsburgh or by UPMC, in concert with the UPMC Office and Physician Relations, have been recruited to participate in the study. Two research assistants have been hired. Patient recruitment and pilot data collection began in September 2010.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): There has been slippage with project milestones because of delays initiating data collection with hospital patients. The data collection was expected to begin in October after the pilot was completed and is now expected to begin in February 2011. The budget is underspent as a result of project delays and difficulty hiring staff.

Preliminary Impact and Findings: The Delphi PCP survey was conducted via a Web-based interface. Rated items in the first round having a 95 percent confidence interval lower boundary of 4.0 or more were defined as accepted by the panel. Items with a 95 percent confidence interval upper boundary less than 3.0 were rejected. All other items were defined as indeterminate. In the second round of the survey, the panel was asked to reconsider those indeterminate data items, showing them their prior rating and the group mean for each item in an effort reach further consensus on those items.

In the first round of the Delphi survey, 37 of 89 items were accepted, one was rejected, and 51 were indeterminate. The second round survey considered these 51 indeterminate items and consensus to accept was found on 6 more items.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
Flu Alert: Influenza Vaccine Alerts for Providers in the Electronic Health Record

Principal Investigator: Stockwell, Melissa S., M.D., M.P.H.
Organization: Columbia University
Mechanism: PAR: HS08-270: Utilizing Health Information Technology to Improve Health Care Quality Grant (R18)
Grant Number: R18 HS 018158
Project Period: August 2009 – July 2012
AHRQ Funding Amount: $1,198,851
Summary Status as of: December 2010

Target Population: Low SES/Low Income*, Medicaid, Pediatric*, Racial or Ethnic Minorities*: Latinos

Summary: The Advisory Committee on Immunization Practices recommends that all children age 6 months and older receive the influenza vaccine. Despite this recommendation, vaccine delivery rates at pediatric clinics are low, even when the vaccine is available. This project aims to tailor, implement, and evaluate influenza vaccine alerts in an electronic health record (EHR) for pediatric providers serving minority, low-income populations at four community health centers.

Each of the four study sites is affiliated with the New York-Presbyterian Hospital Ambulatory Care Network (ACN) and Columbia University and is located in a federally-designated Health Professional Shortage Area. All providers in the study are part of the same General Pediatric Group Practice and receive uniform influenza vaccine-related provider education. In 2008, the practices had a volume of nearly 64,000 visits by approximately 22,000 children, 87 percent of whom were covered by Medicaid and the majority of whom were Latino. The Vaccine for Children Program provides the majority of vaccines given at the practices. All four study sites use the Certification Commission for Health Information Technology-certified product Eclipsys Ambulatory Care Manager EHR and the New York Presbyterian Hospital Immunization Registry, EzVAC.

In Year 1, focus groups; individual interviews; and surveys of health care providers, nurses, and parents were conducted to elicit information for customizing the content, format, and features of the electronic alerts (FluAlert). The alerts were iteratively refined and piloted among beta users based on end-user feedback. In Year 2, the alerts began pilot testing within the four pediatric ACN community health centers of New York-Presbyterian Hospital using a cluster cross-over design. In Year 3, the alerts will be further assessed. Throughout the study period, process indicators will be tracked to follow the implementation of the system, and feedback with clinical sites will be regularly exchanged. At the end of the project, user satisfaction will be assessed through surveys. Cost will be measured by comparing alert costs with published vaccine effectiveness and cost data for influenza-associated hospitalizations, outpatient visits, and impact on parent productivity.

Specific Aims:
• Integrate tailored provider influenza vaccine alerts into the EHRs of urban pediatric community health centers. (Achieved)
• Evaluate the impact of tailored provider influenza alerts on pediatric influenza vaccine delivery rates. 
  (Ongoing)

• Evaluate the impact of tailored provider influenza alerts on pediatric influenza coverage rates. 
  (Ongoing)

**2010 Activities:** The development of the FluAlert application and its integration into the EHR was completed this year. The FluAlert reminder functions with Eclipsys to retrieve immunization information from the EzVAC immunization registry, which is synchronized with New York City’s Department of Health Citywide Immunization Registry. This ensures that the alert is based on the most recent patient-specific influenza vaccine information. Additionally, FluAlert’s graphical user interface (GUI) was designed, evaluated, and revised to reflect feedback from the provider supervisory panel. The GUI alerts the provider to the patient’s influenza immunization status and allows the provider to order an influenza vaccine or document why the vaccine was not given. The alert also allows providers to access important clinical information, such as allergies and immunization history.

Following development of the FluAlert application, the research team met with physicians and nurses to present and improve FluAlert. In response to the information collected from these meetings, the research team added some non-core functions, including print buttons and visual effects. The team also improved upon non-functional aspects of FluAlert, such as performance time, security, and usability.

An end-to-end data transfer mechanism between FluAlert and Eclipsys was also developed. This data transfer mechanism allows FluAlert to pass information back to Eclipsys, where it is automatically included in the provider notes, and facilitates documentation of vaccinations.

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**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** Overall the project is mostly on track and is meeting most of its aims and milestones. The project is on track but slightly underspent due to late distribution of funds.

**Preliminary Impact and Findings:** Analysis of the transcripts from focus groups with physicians about their experiences giving the flu vaccine identified several barriers to influenza vaccine delivery, including clinic resource issues, problems with multiple sources of immunization information, and lack of time to complete the vaccination process. They also identified ways to improve the computerized reminder, such as timing of presentation, ability to access multiple sources of immunization records, and facilitation of vaccine ordering and documentation.

Focus groups were also held with parents to learn more about their experiences with the flu vaccine and their thoughts about how to improve communication with providers. Parents indicated the importance of hearing about both benefits and potential risks of the vaccine, especially when vaccine safety is a concern. Preliminary thematic analysis indicates that parents want to learn about their child’s risk for influenza and the side effects, safety, effectiveness, and timing of the vaccine.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Medication Reconciliation to Improve Quality of Transitional Care

**Principal Investigator:** Weiner, Michael, M.D., M.P.H.

**Organization:** Indiana University

**Mechanism:** PAR: HS08-270: Utilizing Health IT to Improve Health Care Quality Grant (R18)

**Grant Number:** R18 HS 018183

**Project Period:** September 2009 – July 2012

**AHRQ Funding Amount:** $1,181,628

**Summary Status as of:** December 2010

**Target Population:** Adults, Safety Net

**Summary:** Medication errors account for approximately 20 percent of all medical errors in the United States each year. This significant source of error can cause injury or even fatalities and can occur in all types of health care settings, including patient transitions between locations or care levels within a facility. Recent studies have shown that electronic medication reconciliation (MR) for hospitalized patients can decrease medication discrepancies and significantly improve outcomes in transitional and ambulatory care. Relatively little is known, however, about the extent to which MR systems improve clinical outcomes.

This study seeks to integrate an electronic MR system with an electronic prescribing (e-prescribing) system and modify an electronic health record (EHR) to incorporate medication reconciliation. The project is taking place within Wishard Health Services, a safety net provider for residents of Marion County, Indiana which includes Wishard Hospital and eight primary ambulatory care community health centers. This project has a technical and a clinical team, both of which Dr. Weiner is a member. The clinical team provides input and guidance for the technical team, which meets weekly to discuss and advance the system’s development. Because the proposed system requires a formative evaluation, the initial system is being reviewed by a small group of physicians and nurses who are not part of the study teams.

The randomized study design allows for a controlled comparison of electronic MR and usual care. Participants include patients and their inpatient and ambulatory care providers. While the intervention is based in an emergency department and hospital, it targets transitional care and is meant to improve outcomes for both inpatient and ambulatory care. Providers are surveyed before and after the intervention regarding satisfaction with care, managing medications, and usefulness of local information systems in managing medications. Additional analysis will look at changes in the rates of adverse drug events, erroneous discrepancies, and omissions in a patient’s medication list between the time of discharge and return to ambulatory care. Associations between interventions and outcomes will be summarized regarding factors related to payer, race, gender, and age. The study will inform the question of whether electronic facilitation of inpatient MR improves completion of MR and decreases the incidence of drug-related medical errors.

**Specific Aims:**

- Integrate an electronic medical reconciliation system with an e-prescribing system. (Ongoing)
• Modify an EHR system to incorporate medication reconciliation. (Upcoming)
• Conduct a randomized controlled trial of the medical reconciliation system. (Upcoming)
• Determine whether electronic facilitation alters medical reconciliation and the incidence of medication errors in ambulatory care. (Ongoing)

2010 Activities: Activities focused on developing the prototype for the MR system, which was operating in trial mode at the end of 2010. A working interface is expected to be completed in early 2011. Throughout the year, input on the prototype was sought from the project’s clinical team and then tested with an additional group of physicians for further feedback. Multiple rounds of feedback led to several technical changes to the application, including a necessary performance enhancement to speed entry of medications by decreasing repetitive access to the network. Imported medication lists were updated so that Medicaid claims could be reflected. The application was finalized with the activation of a prompt that will appear at the time of discharge. The prompt is intended to remind providers to review pre-admission medication lists. A “wish list” of additional technical enhancements was also collected, based on feedback from early testers and users. For staff that rotates into the medicine service, training materials for using the system were developed.

The project team also designed and implemented a brief survey to ask physicians about satisfaction with local tools and resources for managing inpatient medications, ease of managing medications, and accuracy of medication lists as noted in medical records. Institutional review board approval for the survey was received in July 2010 and the survey was implemented in the fall to obtain baseline information from providers. The survey is being conducted both electronically and on paper to the providers who are rotating into the medicine service, whether they are in the control or intervention group. The study team has received approximately 130 surveys of an overall target of 200. The project team anticipates that some of the survey questions will not be applicable to some of the respondents, and may therefore exclude some of the results from the analysis. The goal is to include between 150-160 surveys in the analysis.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The grant team reports that progress is mostly on track in terms of aims and milestones. The budget is reportedly under-spent but the project team anticipates that spending will eventually catch up, as the delay is typically due to the lag time between when work is performed and when invoicing is received by the subcontractors. Dr. Weiner checks in monthly to ensure that invoices are paid in a timely manner.

Preliminary Impact and Findings: There has been much success in terms of technical development. In terms of who should be documenting the medication history and conducting medication reconciliation, a lack of consensus was observed about who could or should perform this task and therefore medical housestaff could benefit from training on the roles of physicians and pharmacists in this regard. The team has received input from different groups, including providers and pharmacists, about how reconciliation should be done. The project team hopes that bringing these groups together will lead to consensus about how and by whom reconciliation is done, which may in turn set an example for other institutions.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Knowledge Creation
### Table 10. Other Grants (Career, Dissertation, and Other)

#### AHRQ Small Grant Program for Conference Support (R13) and AHRQ Grant Program for Large Conference Support (R13) and (U13)

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<tr>
<th>Completed in 2010</th>
<th>Principal Investigator</th>
<th>Project Title</th>
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<tr>
<td>No</td>
<td>Calmbach, Walter, MD</td>
<td>Primary Care Research Methods and Statistics Conference</td>
<td>PAR09-257</td>
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<tr>
<td>Yes</td>
<td>Landon, Bruce, MD</td>
<td>A Research Agenda for the Patient-Centered Medical Home</td>
<td>PAR09-231</td>
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<td>Yes</td>
<td>Marcin, James, MD</td>
<td>Fourth Annual Pediatric Telehealth Colloquium</td>
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#### Special Emphasis Notice: AHRQ Announces Interest in Career Development (K01, K02, K08) and Dissertation (R36) Grants Focused on Health Information Technology (IT)

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<td>No</td>
<td>Armstrong, April, MD</td>
<td>Patient-Centered Online Care Model for Followup Management of Atopic Dermatitis</td>
<td>HS08-014</td>
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<td>No</td>
<td>Baer, Heather, ScD</td>
<td>Use of Electronic Health Records for Addressing Overweight and Obesity in Primary Care</td>
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<td>Yes</td>
<td>Barrette, Eric, MA</td>
<td>The Impact of Health Information Technology on Demand for Inpatient Services</td>
<td>HS08-014</td>
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<td>No</td>
<td>Del Fiol, Guilherme, MD, MS, PhD</td>
<td>Context-Aware Knowledge Delivery into Electronic Health Records</td>
<td>HS08-014</td>
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<td>Yes</td>
<td>Delrahim-Howlett, Katia, MPP, MBA, PhD (in progress)</td>
<td>Web Based Intervention for Alcohol Use in Women</td>
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<td>No</td>
<td>Gesteland, Per, MD, MS</td>
<td>Using Health Information Technology to Support Population-Based Clinical Practice</td>
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<td>No</td>
<td>Koopman, Richelle, MD, MSCR</td>
<td>Patient Readiness to Use Internet Health Resources</td>
<td>HS08-014</td>
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<td>No</td>
<td>Lafleur, Joanne, PharmD, MSPH</td>
<td>Knowledge Engineering for Decision Support in Osteoporosis</td>
<td>HS08-014</td>
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<td>No</td>
<td>Rand, Cynthia M., MS, MD, MPH</td>
<td>Using Health Information Technology to Improve Delivery of HPV Vaccine</td>
<td>HS08-014</td>
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### Project Summaries

#### Centers for Education and Research on Therapeutics (CERTs) (U18)

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<td>Health Information Technology and Improving Medication Use</td>
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#### AHRQ Health Services Research Projects (R01)

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<td>No</td>
<td>Carroll, Aaron, MD</td>
<td>Computer Automated Developmental Surveillance and Screening</td>
<td>PA09-070</td>
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Primary Care Research Methods and Statistics Conference

Principal Investigator: Calmbach, Walter
Organization: University of Texas Health Sciences Center
Mechanism: PA: HS06-378: AHRQ Grant Program for Large Conference Support (R13) and (U13)
Grant Number: R13 HS 017658
Project Period: September 2008 – September 2011
AHRQ Funding Amount: $182,621
Summary Status as of: December 2010

Target Population: General

Summary: Economic constraints have limited the number of fellowship programs that train primary care researchers. This presents a gap in necessary mentoring and ongoing training of both fellowship- and non-fellowship-trained researchers. To address this need, this grant supports the Primary Care Research and Methods and Statistics Conferences which are held to build research capacity of both novice and experienced researchers. For novice researchers, the conferences develop basic research skills, such as planning and conducting simple studies and communicating results. For experienced researchers, the conferences build understanding of research techniques and statistical approaches to conducting high-quality, sophisticated primary-care studies.

Primary Care Research and Methods and Statistics Conferences were held December 5-7, 2008, March 19-22, 2009, and January 22-24, 2010. The conferences included a pre-conference workshop for experienced researchers, plenary sessions, a Dissection of Innovative Studies and a Methodological Think Tank Process workshop, and offered two theme-based seminar tracks. Conference attendees were asked to evaluate each speaker and the conference itself. Information about the conference is disseminated to primary care researchers through professional society newsletters, e-mail Listservs, Web sites, and professional annual meetings, to promote attendance.

Specific Aims:
- Help novice researchers develop basic research skills. (Achieved)
- Help experienced researchers expand their repertoire of research methodologies. (Achieved)

2010 Activities: The 2010 conference, “Complexity Science: Applications in Primary Care Research,” held January 22-24, was designed to be multidisciplinary and attract a wide variety of researchers, including health services, family medicine, internists, and pediatricians.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Not Applicable
Business Goal: Synthesis and Dissemination
A Research Agenda for the Patient-Centered Medical Home

Principal Investigator: Landon, Bruce, M.D.
Organization: Society of General Internal Medicine
Mechanism: PA: HS06-074: Small Grant Program for Conference Support (R13)
Grant Number: R13 HS 017995
Project Period: March 2009 – February 2010
AHRQ Funding Amount: $46,010
Summary Status as of: February 2010, Completion of Grant

Target Population: General

Summary: The patient-centered medical home (PCMH) is emerging as a new model for providing population-based, patient-centered primary care. Despite professional interest and endorsement however, there is limited evidence on what impact the PCMH model has on the cost and quality of health care services, so questions remain on how to best implement, measure, and pay for this new service delivery model. Further implementation requires research to better understand the model’s impact on providers and policymakers. Specifically, there is a need to understand the marginal effectiveness of the PCMH over the traditional primary care model.

The Research Agenda for a Patient-Centered Medical Home conference convened national researchers, representatives of major primary care professional organizations, health care purchasers, payers, patient advocates, and policymakers to discuss the research agenda needed to move PCMH from a demonstration model to an evidenced-based standard of care.

Specific Aims:
• Inform and advance the state-of-the-art-and-science and real-world experience about the PCMH. (Achieved)
• Develop partnerships and build capacity to implement a practical evaluation model that can be used by health plans, government payers, and policymakers to assess components of the PCMH and alternative models. (Achieved)
• Develop and recommend a research agenda to inform the development and broad implementation of the PCMH model. The research agenda will specifically address the “business case” for adopting the PCMH model as well as the clinical and cost consequences of implementing PCMH. (Achieved)
• Disseminate the synthesis of the conference, including background and descriptive information, via peer-reviewed literature, the Web, and presentations at relevant national health policy and professional association meetings. (Achieved)

2010 Activities: Several manuscripts developed out of the 2009 conference were published in 2010. The conference was held on July 27th and 28th, 2009 in Washington, DC. It was cohosted by the Society of General Internal Medicine, the Society of Teachers of Family Medicine, and the Academic Pediatrics Association, with support from the Agency for Healthcare Research and Quality, the American Board of Internal Medicine Foundation, and the Commonwealth Fund.
Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The conference was held in 2009 on schedule and on budget.

Impact and Findings: Findings from the conference were discussed in several manuscripts, seven of which were published in the Journal of General Internal Medicine, and one which was published in Health Affairs.

Strategic Goal: Not Applicable

Business Goal: Synthesis and Dissemination
Fourth Annual Pediatric Telehealth Colloquium

**Principal Investigator:** Marcin, James
**Organization:** University of California, Davis
**Mechanism:** PA: Small Grant Program for Conference Support (R13)HS06-074:
**Grant Number:** R13 HS 018310
**Project Period:** September 2009 – August 2010, Including No-Cost Extension
**AHRQ Funding Amount:** $49,520
**Summary Status as of:** August 2010, Completion of Grant

**Target Population:** Medically Underserved, Pediatric

**Summary:** Regionalization of children’s services has led to higher quality care and improved outcomes for pediatric patients. However, regionalization can lead to disparities in access for children living in nonurban areas. Telemedicine allows pediatricians and pediatric specialists to provide care to children who live in rural, remote, and underserved communities, thereby reducing health care delivery disparities.

The Fourth Annual Pediatric Telehealth Colloquium built upon previous conferences to show participants how telemedicine can be used in a variety of care settings, to increase quality of care and reduce health care costs, and how to create a financially-sustainable framework. The conference covered the topics of basic telemedicine and telecommunications technology; ways that telemedicine can be used to improve outreach, strategic, and administrative planning; funding opportunities; technical and equipment support; and techniques for education, research, and advancement of telemedicine in existing programs. The program was promoted to all remote sites that currently use telemedicine and those that are interested in using telemedicine. The conference subsidized the attendance cost of rural providers and providers working in medically-underserved communities.

**Specific Aim:**
- Disseminate information about how telemedicine is used in a variety of care settings, how telemedicine improves access and increases education, and how to create a financially-sustainable framework to decrease disparities in care, increase the overall quality of care, and decrease overall health care costs. **(Achieved)**

**2010 Activities:** The conference was held on September 24 and 25, 2009 in Palm Springs, California, as part of the American Telemedicine Association Mid-Year Meeting. The learning objectives and main areas of the conference were: overview of current status of telemedicine in pediatric care; administrative and strategic planning; inpatient and outpatient specialty care; international telemedicine; education and telemedicine; child development and telemental health; and alternate applications of telehealth. All conference presentations were compiled on a CD, which is available to conference participants.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of August 2010):** The conference was completed in 2009 on time and on budget. There were no activities to report on in 2010.

**Impact and Findings:** All conference presentations were compiled on a CD.
**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

* AHRQ Priority Population
Patient-Centered Online Care Model for Followup Management of Atopic Dermatitis

Principal Investigator: Armstrong, April, M.D.
Organization: University of California Davis
Mechanism: PAR: HS09-085: Mentored Clinical Scientist Research Career Development Award (K08)
Grant Number: K08 HS 018341
Project Period: November 2009 – November 2014
AHRQ Funding Amount: $713,340
Summary Status as of: December 2010

Target Population: Adults, Condition Specific: Atopic Dermatitis, Pediatric

Summary: Access to timely, high-quality dermatologic care poses a significant challenge in the United States. Store-and-forward teledermatology—defined as the practice of dermatology through digital capturing and storage of clinical images and information, followed by asynchronous review of the clinical information by a dermatologist—presents an opportunity to improve patient satisfaction and access to dermatological specialist care.

The project, started in November 2009, introduced a patient-centered, technology-enabled model for delivering followup specialty care. Specifically, dermatologists from the University of California Davis Medical Center participate in an asynchronous, online model for delivering direct followup dermatology care to patients with atopic dermatitis, a chronic skin disease from which millions of Americans suffer. In this online model, patients communicate directly with their dermatologists, capture and transmit digital skin images, and receive online treatment recommendations and prescriptions via RelayHealth software.

The year-long randomized controlled trial (RCT) will compare clinical outcomes, quality of life, patient satisfaction, and knowledge about their skin disease of dermatology patients receiving conventional, face-to-face followup care to patients receiving followup care via the patient-centered care online model. This model has the potential to be adapted for patients suffering from other medical conditions that require regular followup visits to specialists.

In addition to the research project goals, Dr. Armstrong aims to further her long-term career goal of increasing access to specialist care for patients in rural and medically underserved communities. Funding from this Mentored Clinical Scientist Research Career Development Award will allow Dr. Armstrong to advance her skills in health services research through structured coursework and regular seminars and mentoring with leaders in health services research, dermatology, and telemedicine.

Specific Aims:

• Assess the effect of this asynchronous, online model for delivering direct, followup dermatologic care on clinical outcomes in patients with atopic dermatitis. (Ongoing)

• Evaluate the effect of this asynchronous, online model for delivering direct, followup dermatologic care on quality of life in patients with atopic dermatitis. (Ongoing)
• Determine the level of patient satisfaction and patient knowledge about atopic dermatitis in the asynchronous, online model for delivering direct, followup dermatologic care. **(Ongoing)**

**2010 Activities:** The main activity in 2010 was the initiation of the RCT. The project achieved its recruitment goal of 150 patients and by mid-December, approximately 30 patients had completed the year-long study, which included five dermatology visits, either online or traditional office visits, conducted at 8-week intervals. Attrition of patients has been low in both arms of the study. Patients in both the intervention and the control groups complete multiple self assessment tools at each visit, including the Patient-Oriented Eczema Measure to assess disease severity and the Dermatology Life Quality Index or Children’s Dermatology Life Quality Index to assess dermatology specific quality of life.

**Preliminary Impact and Findings:** The RCT is ongoing, thus the project is still in the data collection phase and does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Use of Electronic Health Records for Addressing Overweight and Obesity in Primary Care

**Principal Investigator:** Baer, Heather, Sc.D.

**Organization:** Brigham and Women’s Hospital

**Mechanism:** PAR: HS09-087: Mentored Research Scientist Research Career Development Award (K01)

**Grant Number:** K01 HS 019789

**Project Period:** September 2010 – August 2015

**AHRQ Funding Amount:** $127,047

**Summary Status as of:** December 2010

**Target Population:** Adults, Obesity

**Summary:** Obesity is widely recognized as a critical public health concern that is associated with increased risk of diabetes, cardiovascular disease, cancer, and all-cause mortality. Electronic health records (EHRs) have the potential to improve diagnosis and treatment of obesity by primary care clinicians. However, very few EHR-based tools have been developed or evaluated for this purpose.

The objectives of this research are to improve diagnosis and treatment of overweight and obese patients by working closely with primary care clinicians to develop better EHR-based tools for identification, diagnosis, and treatment. These may include reminders, clinical decision support, automatic e-mail referrals, and information for clinicians and patients. The EHR-based tools will be piloted in one primary care practice for three months. Based on the pilot, a larger randomized controlled trial at 12 diverse ambulatory clinics in the Boston, Massachusetts area will be conducted to assess the effectiveness of the EHR-based tools for the identification, evaluation, and treatment of overweight and obese individuals in the primary care setting.

**Specific Aims:**

- Develop EHR-based tools to help primary care clinicians identify, evaluate, and treat patients who are overweight or obese. **(Ongoing)**

- Conduct a randomized controlled trial to assess the effectiveness of EHR-based tools for the identification, evaluation, and treatment of overweight and obesity in primary care. **(Upcoming)**

In addition to the specific research aims, as part of this Mentored Research Scientist Research Career Development Award, Dr. Baer is working toward the following long-term career goals: 1) to develop a multidisciplinary research program that is dedicated to developing and evaluating strategies to address obesity and other modifiable risk factors in the clinical setting; and 2) to teach and mentor other individuals who wish to pursue careers in clinical epidemiology or health services research.

**2010 Activities:** The team is learning more about the context of obesity management in adult primary care for which the EHR-based tools will be developed. They are talking to other experts in the field including obesity and EHR experts and, with the help of an expert panel that has been formed, are developing a detailed outline of the features that have the most potential to support obesity assessment and management. In 2011, Dr. Baer will formally present the proposed features to be added to the
Longitudinal Medical Record (LMR) Executive Committee and the Clinical Content Committee. Based on their approval, the programming of the new tools in the LMR will begin in spring 2011, for launch in fall 2011. Some of the features under consideration are: 1) reminders to collect height and weight; 2) provider alerts asking the provider to add the diagnosis to the problem list when, based on body mass index, a patient is identified as obese or overweight; and 3) graphs to show weight trends over time and to calculate weight loss goals for patients.

**Preliminary Impact and Findings:** The project has no findings to date.

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goals:** Knowledge Creation
The Impact of Health Information Technology on Demand for Inpatient Services

Principal Investigator: Barrette, Eric, M.A.
Organization: University of Minnesota, Twin Cities
Mechanism: PAR: HS06-118: AHRQ Grants for Health Services Research Dissertation (R36)
Grant Number: R36 HS 018272
Project Period: September 2009 – April 2011, Including No-Cost Extension
AHRQ Funding Amount: $24,642
Summary Status as of: December 2010

Target Population: Elderly*, Medicare

Summary: The influence of the adoption of health information technology (IT) on where consumers decide to receive hospital inpatient services is largely unknown. These decisions affect the costs and quality of those services and the market power of the hospitals. This project is examining the role of health IT in meeting inpatient health care service demands. This demand analysis complements existing supply-side analyses to provide more complete and dynamic estimates of the impact that health IT has on health care markets. It allows policymakers and the health care industry to make better decisions on optimal health IT adoption and implementation strategies.

The analysis requires information about hospitals’ characteristics and information technology as well as patients’ characteristics and hospital choices. Data needed to perform this analysis comes from several sources. Hospital characteristics data are obtained from the American Hospital Association (AHA) annual survey. This database contains information on hospitals’ physical and organizational characteristics such as location, number of full-time physicians, services provided, and number of beds. The AHA database is linked with the Health Information and Management Systems Society Analytics Database. This dataset contains detailed historical information on the health IT software, hardware, and infrastructure installed in the surveyed hospitals. Inpatient Medicare claims data are the source of patient-level choices and characteristics. Regional demographic data from the 2000 U.S. Census are also included.

The econometric methods for this project estimate the demand for hospital services using patient characteristics, hospital characteristics, and observed patient choices. A hospital’s decision to implement health IT is considered a treatment or policy intervention, and the change in the total number of patients using the hospital is the outcome of interest. A discrete choice model is using patient-level data to estimate the probabilities of patients choosing each hospital in their choice set. The parameter estimates from these models show how health IT affects a patient’s likely hospital choice. Advanced, discrete-choice modeling is applied to deal with biased and inconsistent parameter estimates if they arose.

Specific Aims:

- Measure the effect of hospital adoption of health IT on the demand for inpatient care. (Ongoing)
- Estimate the impact of health IT by type of inpatient service. (Ongoing)
- Evaluate the effect of changes in patient hospital choices using consumer surplus as a welfare measure. (Ongoing)
**2010 Activities:** All data has been cleaned and merged for the database. Preliminary data analysis using the original model showed that the data sets were too big and were not converging. As a result, additional models and model specifications were tested. The resulting comparable approach used aggregate data to address the issue with data set size. Eight years of data for a subset of three states were ultimately analyzed.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The project is meeting most of its aims on time. Budget spending is roughly on target. The acquisition of data and model specification took longer than anticipated, resulting in a request for a no-cost extension.

**Preliminary Impact and Findings:** Preliminary results suggest that health IT does not have a significant effect on patient demand.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Context-Aware Knowledge Delivery into Electronic Health Records

Principal Investigator: Del Fiol, Guilherme, M.D., M.S., Ph.D.
Organization: University of Utah
Mechanism: PAR: HS09-087: Mentored Research Scientist Research Career Development Award (K01)
Grant Number: K01 HS 018352
Project Period: September 2009 – July 2013
AHRQ Funding Amount: $575,729
Summary Status as of: December 2010

Target Population: Adults

Summary: The Institute of Medicine (IOM) report, *Crossing the Quality Chasm: A New Health System for the 21st Century*, called for an overhaul of the U.S. health care system, declaring that new models of care should make health care more safe, effective, patient-centered, timely, efficient, and equitable. New models of care have been proposed that are in line with IOM’s aims, such as the American Academy of Pediatrics’ Medical Home and the Future of Family Medicine’s project New Model.

A main cause of errors in the health care system is gaps in the information available to providers. The provision of just-in-time access to relevant knowledge is essential for the implementation of new models of care. Immediately-available information helps patients and providers make better decisions. Information delivered immediately helps providers explain patient care options and retrieve and manage the best, up-to-date knowledge available at the point of care.

The goal of the proposed research is to develop, implement, and evaluate a prototype for a scalable and widely-deployable knowledge delivery service, (the “knowledge broker”), that is capable of automatically delivering context-specific information from online resources into electronic health record (EHR) systems via a “knowledge dashboard.” This will help providers address their knowledge gaps and will lead to better and more informed decisions.

A systematic literature review in combination with focus groups will document provider knowledge needs. This information will inform the development of the knowledge dashboard. Once developed, the knowledge dashboard will be integrated into an EHR for use by providers.

Four core design requirements will drive the development of the knowledge broker to guarantee its scalability and wide deployability: 1) the architecture will be open, independent, standards-based, and services-oriented; 2) the knowledge base will be expandable to accommodate additional knowledge needs in various contexts; 3) the knowledge broker will be able to deliver knowledge through mechanisms other than a knowledge dashboard, such as infobuttons; and 4) the knowledge broker will be able to account for the needs of and deliver knowledge to providers and patients. This will help the dashboard be a potential national model for knowledge delivery at the point of need.

This project will investigate why, how, and when users interact with the knowledge dashboard, as well as the effect of these interactions on the fulfillment of knowledge needs and decisionmaking. Finally, the
study will identify areas and opportunities for system enhancement and expansion. An exploratory data analysis will determine the feasibility and planning of a future large-scale quantitative investigation.

**Specific Aims:**

- Build a knowledge base of patients’ and providers’ knowledge needs. *(Ongoing)*
- Design, develop, and evaluate the usability of a scalable, widely deployable knowledge delivery service in a laboratory setting. *(Ongoing)*
- Conduct a mixed-method assessment of a pilot implementation of the knowledge broker in a real-world medical home environment. *(Upcoming)*

In addition, as part of his Mentored Research Scientist Research Career Development Award (K01), Dr. Del Fiol has completed additional training in clinical and health services research and leadership through the Duke University School of Medicine Clinical Research Training Program.

**2010 Activities:** A protocol for the systematic literature review was completed and the literature review initiated. A total of 8,800 abstracts were screened in the first round and yielded 718 full-text articles that met the criteria for the second phase. A second reviewer protocol was developed and reliability testing completed. Seventy eight full-text articles met the inclusion criteria; data from these will be abstracted.

The Dr. Del Fiol adapted work that was done with the Veteran’s Administration (OpenInfobutton) to build some of the knowledge-delivery service infrastructure, and the project entered into a system testing phase. Institutional Review Board (IRB) approval for focus groups was granted. Dr. Del Fiol engaged in significant training in clinical and health services research as part of his educational objectives.

Dr. Del Fiol changed his employment to the University of Utah and transferred the project, including IRB approvals, with him. Collaborations were established with the Salt Lake Veterans Affairs Medical Center, Intermountain Healthcare, University of Utah Center on Aging, and the University of Utah Health Sciences Library.

**Preliminary Impact and Findings:** The project does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Web-Based Intervention for Alcohol Use in Women

**Principal Investigator:** Delrahim-Howlett, Katia, M.P.P., M.B.A., Ph.D.

**Organization:** University of California San Diego

**Mechanism:** PAR: HS06-118: AHRQ Grants for Health Services Research Dissertation (R36)

**Grant Number:** R36 HS 018071

**Project Period:** June 2009 – May 2010

**AHRQ Funding Amount:** $37,800

**Summary Status as of:** May 2010, Conclusion of Grant

**Target Population:** Low SES/Low Income*, Women*

**Summary:** Fetal alcohol spectrum disorders (FASDs) arise from prenatal exposure to alcohol and are among the most common developmental disabilities in the United States, occurring in as many as one in 100 children. Despite widespread educational efforts about the fetal health risks associated with prenatal alcohol use, recent estimates from the Centers for Disease Control and Prevention indicate that 10 percent of women who know they are pregnant report alcohol use. Thus, there is a need for more effective primary prevention and intervention programs to reduce alcohol intake before conception and during pregnancy. This need is amplified among low-income women who may be more vulnerable to prenatal alcohol use and whose children, therefore, are at higher risk of alcohol-related developmental abnormalities. From a public health perspective, the use of health information technology to develop self-administered, cost-efficient methods for conducting alcohol assessments and delivering targeted interventions has broad-based appeal for integration into maternal and child primary care. Furthermore, if such methods are applied to low-income populations, the recognized health disparities associated with alcohol use in pregnancy will be better addressed.

This project worked with women whose children or dependents receive services through the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) in San Diego County, California. A small-scale, randomized controlled trial tested an adapted version of an existing Web-based program to reduce alcohol consumption in non-pregnant women who drink at risky levels. A second objective evaluated the sustainability in the reduction of alcohol consumption between women who received the Web-based feedback intervention and women who did not. Qualified and consenting participants were randomly assigned to complete the Web-based assessment and receive generic information about FASDs, or to complete the Web-based assessment and receive a personalized feedback intervention. All participants completed followup assessments on reported alcohol consumption at 1 and 2 months post-baseline.

The results of this study contributed to: 1) knowledge of the feasibility of using a Web-based medium to efficiently and accurately assess alcohol use in vulnerable populations; 2) identification of potentially cost-effective prevention and intervention strategies that can address health disparities in preconception and prenatal education and health care; 3) validation of the effectiveness of an existing Web-based program that may have wide-ranging applicability in maternal and child health primary care; and 4) extension of theoretical frameworks involved in using an innovative intervention delivery medium to further advance the science of eHealth.
Specific Aims:

- Evaluate the effectiveness of the adapted Web-based assessment and intervention program in reducing risky alcohol consumption in non-pregnant women who have children or dependents enrolled in WIC by comparing rates of reduction in alcohol consumption between women who receive the Web-based feedback intervention and women who do not at 1 month post-baseline. The rates of reduction were measured by analyzing mean drinks per occasion and number of risky-drinking occasions. (Achieved)

- Evaluate the sustainability of reduction in alcohol consumption (number of risky-drinking occasions) between women who receive the Web-based feedback intervention and women who do not at 2 months post-baseline among women reporting a reduction at 1 month post-baseline. (Achieved)

In addition to the specific research project aims, this grant for a Health Services Research Dissertation Award supported Katia Delrahim-Howlett, a student in the Joint Doctoral Program in Public Health at San Diego State University and University of California, San Diego.

2010 Activities: The focus of activities was on final analysis of the intervention in which a total of 150 binge-drinking participants completed a Web-based assessment and were randomly assigned to receive either a personalized feedback intervention or general health information about alcohol consumption and fetal alcohol syndrome. Followup assessments on reported alcohol consumption were conducted via telephone at 1- and 2-months post-baseline.

Impact and Findings: Participants ranged from 18 to 44 years-of-age and 44 percent were Hispanic or Latina. Outcome data were available for 131 participants. The main outcome measure was reduction in number of risky-drinking occasions, and did not differ significantly between treatment conditions. However, more than 70 percent of the participants reported a reduction in risky-drinking occasions regardless of treatment condition (control 68 percent; experimental 72 percent). Furthermore, after controlling for confounding in a multivariate hierarchical logistic regression model, the estimate of treatment effect reached borderline significance. The results of the present study demonstrate that Web-based assessment of alcohol consumption among low-income women of reproductive age, as represented by WIC clients, is feasible and acceptable. The findings also suggest that detailed and interactive assessments of alcohol consumption may be sufficient for the reduction of risky drinking within this population and personalized feedback may provide additional benefits for some individuals.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Using Health Information Technology to Support Population-Based Clinical Practice

Principal Investigator: Gesteland, Per, M.D., M.S.
Organization: University of Utah
Mechanism: PAR: HS09-085: Mentored Clinical Scientist Research Career Development Award (K08)
Grant Number: K08 HS 018538
Project Period: September 2009 – July 2014
AHRQ Funding Amount: $795,960
Summary Status as of: December 2010

Target Population: Acute Respiratory Infections, Pediatric

Summary: Acute respiratory infections (ARIs) are a major burden to the health care delivery system and the public’s health. The overuse of antibiotics for viral infections has contributed to the rapid emergence of antimicrobial resistance and a substantial number of adverse drug events. As a result, research on preventing the overuse of antibiotics is a national priority. This project aims to improve providers’ and patients’ ability to distinguish viral infections from bacterial infections by providing timely, accessible information about the local incidence of common respiratory viruses via a population health repository and decision support tools.

Intermountain Healthcare, affiliated with the University of Utah School of Medicine, developed Germ Watch (https://intermountain.net/portal/site/mdvs/i), a reporting system for pediatric respiratory infections that imports data from all Intermountain Healthcare system practices. The reports display pathogen-specific data presented in graphs on the Web site with a user interface to select for age ranges, pathogens, and regions. The overall goal of the project is to refine this dashboard and further integrate it into clinical workflow.

This study will address important gaps in patients’ and providers’ population-based health knowledge and the information technology tools required to fill these gaps. The lessons learned through developing, implementing, and evaluating the impact of population health and decision support tools for ARI treatment will lead to significant scientific contributions in this research area and will improve the integration of decision support tools at health care practices.

Specific Aims:

• Assess primary care clinician use of current population-based ARI health information resources and decision support tools using focus groups and structured observation. (Ongoing)
• Refine population-based ARI health information resources and decision support tools to improve clinical information system workflow integration and patient communication. (Ongoing)
• Implement these population-based ARI health information resources and decision support tools in primary and urgent care settings. (Upcoming)
• Measure the effects of population-based ARI health information resources and decision support tools on population-based clinical practice and patient and parent compliance. The goal of these
interventions is to increase the effectiveness and appropriateness of antibiotic prescribing for ARI. (Upcoming)

In addition to the specific research project aims, Dr. Gesteland has, as part of this Mentored Clinical Scientist Research Career Development Award, the following career goals:

• Expand existing skills in the extraction, analysis, and graphical display of health care data using electronic data warehouses, business intelligence platforms, and the Web 2.0.
• Develop new expertise in the cognitive science of data and information visualization and display to support clinical decisionmaking and patient-centered care delivery.
• Develop additional expertise in the integration and implementation of knowledge management and decision support tools in clinical information systems.
• Develop additional skills in conducting health information technology intervention studies including workflow analysis, cluster-randomized control and quasi-randomized controlled trials, interrupted time series analysis, and controlled before-and-after studies suitable for testing proposed intervention.
• Expand and refine existing skills in measuring the effect of information or communications systems on the quality and productivity of health care.

2010 Activities: Initial 2010 work has focused on: determining how providers use population-based ARI health information resources and decision support tools, understanding the level of interest that patients and parents have in having access to viral epidemic data, and evolving the system infrastructure to support improved and enhanced data visualization. The original plan to conduct focus groups with providers was changed to an approach involving one-on-one contextual interviews in which the principal investigator sits with providers and reviews how they use current tools and information resources, and solicits ideas for how the system could be improved. The switch to contextual interviews was based upon advice from the research organization’s Strategic Planning Group that has extensive expertise in conducting focus groups and soliciting input from physicians. During the interviews the project team showed providers dashboard prototypes, which they continue to refine in an iterative fashion. Dr. Gesteland has been incorporating methods of Cognitive Task Analysis that he initially learned about at the Health Information Technology Grantee and Contractor meeting in June 2010. By December 2010, Dr. Gesteland has completed three of the targeted 20 projected interviews. In addition to these formal interviews, Dr. Gesteland has had numerous impromptu discussions with physicians about their information needs and ideas for improving the current system. Overall, feedback has been very positive and numerous ideas have been provided on how to improve the functionality of the tool and better integrate it into clinical workflow as a dashboard.

Activities in 2010 also included two focus groups with parents of patients to help inform the development of patient-facing components of the decision support tools being developed. The intent of these focus groups was to assess parent information needs relevant to ARI, understand where parents receive ARI information, and determine parent preferences on ARI information and how it should be presented. Focus group participants included both first-time parents and parents with multiple children. An additional focus group for Spanish-speaking parents is planned.

The research team has made substantial progress with evolving the system infrastructure to support improved and enhanced data visualization. The team analyzed the content of current reports for common information communication objectives and interviewed system users (administrators, clinicians, infectious disease experts, and epidemiologists) to understand their goals and tasks when accessing current reports and tools. Using weekly counts of positive tests and percent positive, the team developed
pathogen-specific activity thresholds by analyzing historical outbreaks. These thresholds were used to develop a set of dashboard elements that present pathogen-specific indicators of activity (None, Minimal, Moderate, Heavy, Intense), trend (5 weeks, 1 year, 5 years), severity (percent inpatient, critical, respiratory failure), and regions affected.

**Preliminary Impact and Findings:** During the focus groups with parents, participating parents reported interest in having access to the type of information about common viral epidemics that the Germ Watch system provides. These findings were presented to Intermountain Healthcare’s Pediatric Guidance Council, which subsequently has generated discussion and early planning such as discussions with the public relations office about the development of a public-facing version of Germ Watch. The vision of this spin-off project is to provide the equivalent of a weather report for respiratory viruses that could be published in the local news media.

The development of the dashboard will be presented in May 2011 as a platform presentation at the meeting of the Pediatric Academic Societies.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Patient Readiness to Use Internet Health Resources

**Principal Investigator:** Koopman, Richelle, M.D., M.S.C.R.

**Organization:** University of Missouri, Columbia

**Mechanism:** PAR: HS09-085: Mentored Clinical Scientist Research Career Development Award (K08)

**Grant Number:** K08 HS 017948

**Project Period:** March 2009 – February 2014

**AHRQ Funding Amount:** $723,592

**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Diabetes

**Summary:** As the burden of chronic disease increases in the United States and throughout the world, new approaches are needed to adequately care for people with chronic conditions. The Chronic Care Model suggests processes and systems that can help optimize the care of patients with chronic disease. It emphasizes patient self-activation because activated patients are prepared to take a collaborative, if not central, role in managing their own health. Online health resources could potentially provide a sustainable and patient-centered format for delivering the education, communication, and self-management resources needed to optimize patient activation. However, Web-based resources for chronically ill patients are only valuable if patients have the computer skills and motivation to use them.

This project examines patient readiness, in terms of both aptitude and desire, to use Web-based health resources such as patient education, self-management tools, online prescription refills, requests, medication reconciliation, and secure messaging. The study looks at the relationship between motivation for behavioral change and the use of online health resources and interactive online communication between the patient and the health care team. To help examine the question of patient readiness, the project team is developing a practical measure of the readiness of ambulatory patients with chronic conditions to use Web-based health resources. The first aim of the study is to test the measure’s predictive validity against logs of actual use of Web-based health resources by such patients, and directly observe their use of these Web resources. The second aim is to examine how use of an interactive online patient portal is associated with improvements in clinical measures for patients with type 2 diabetes.

This examination of preferences for use of Web-based health resources among ambulatory patients with chronic disease will inform projects, systems, and policies that seek to use the online environment as part of a comprehensive disease management strategy.

**Specific Aims:**

- To develop a measure of the readiness (aptitude and desire) of patients with chronic conditions attending primary care clinics to use Web-based health resources for health information exchange. This measure will be called the Electronic Health Information Exchange Readiness Scale (E-HIERS). *(Ongoing)*

- To determine how the frequency and type of use of Web-based health resources are associated with improvements in clinical measures for patients with type 2 diabetes. *(Upcoming)*
In addition to the specific research project aims, Dr. Koopman, as part of her Mentored Clinical Scientist Research Career Development Award, has an overarching goal to improve the quality and safety of patient care for those with chronic conditions. This will be attained via the following short-term career goals: 1) to acquire expertise in scale development, such as the E-HIERS Scale; 2) to develop an understanding of the intersection of information and learning in health applications, focusing on both the human and technological dimensions; 3) to gain scientific and career guidance from local collaborators, advisors, and consultants; and 4) to acquire skills in leadership and management from professional development seminars and a longitudinal self-improvement plan developed in collaboration with a mentor.

**2010 Activities:** Activities primarily included the analysis of the focus group findings, using qualitative software to analyze responses, to inform development of the scale to measure patient readiness to use Internet health resources. The complete scale development, which is scheduled over a period of 2 to 3 years, has also been informed by a comprehensive literature review of validated items from previously published scales, all of which were examined in terms of risk perception, motivation, anxiety, and trust. Quantitative and qualitative evaluations will help to validate the scale. Feasibility testing of the scale began in November 2010, during which the questionnaire was administered in conjunction with a cognitive interview to help determine if any of the questions were confusing or misinterpreted. The questionnaire is divided into various sections related to computer use, familiarity with the Internet, e-mail use, and communication with their health care provider. The questions are grouped thematically but are aligned with themes found in the focus groups. Once feasibility testing is complete, the scale will be revised as necessary and administered to 200 participants.

**Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010):** The research team made significant progress this year. The recruitment goal of 15 participants in the feasibility testing phase is well within reach. Dr. Koopman reports that all project milestones were met on time and spending is roughly on target.

**Preliminary Impact and Findings:** Dr. Koopman is developing a manuscript based on the focus group findings, which indicated that promoters of online health resource use included speed, convenience, and the ability to look up information before a visit with a physician. Primary barriers to online health resource use included Internet security and privacy concerns. Some general conclusions drawn from the results are that the use of online information among patients with chronic conditions is an accessory to their relationship with their physician, that patients with less-established relationships may rely on the Internet more heavily, and that patients are using the Internet to enhance care by becoming more informed consumers, confirming the Chronic Care Model. These results were used to inform development of the scale to measure patient readiness to use Internet health resources.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Knowledge Engineering for Decision Support in Osteoporosis

Principal Investigator: LaFleur, Joanne, Pharm.D., M.S.P.H.
Organization: University of Utah
Mechanism: PAR: HS09-085: Mentored Clinical Scientist Research Career Development Award (K08)
Grant Number: K08 HS 018582
Project Period: January 2010 – December 2014
AHRQ Funding Amount: $805,680
Summary Status as of: December 2010

Target Population: Osteoporosis, Veterans

Summary: There are many factors that influence how and if chronic diseases such as osteoporosis are identified and treated. They include process barriers, such as workflow and organization, and information and cognitive barriers, such as the saliency of the problem and suboptimal organization of information relevant to the treatment decision. Specific cognitive barriers to identifying and treating osteoporosis include failure to identify that a patient is at high risk for a fragility fracture, not knowing what level of risk justifies treatment, and uncertainty about when to initiate treatment. This is one of the reasons why, despite the high burden of osteoporosis, fewer than 25 percent of veterans who are at risk for fracture are currently treated for osteoporosis.

While computerized clinical decision support has the potential to improve appropriate treatment rates by identifying patients at risk, such systems are often poorly developed and may not reflect physicians’ models for conducting clinical tasks or preferences for structuring tasks and navigating systems, thus reducing the system’s optimal impact.

The overall goal of this project is to develop robust knowledge for supporting accurate osteoporosis-related treatment decisions that addresses these information barriers. Specifically, the investigators will use electronic and survey data to create a new risk-stratification rule. This rule will adapt a currently accepted risk-stratification rule and the World Health Organization’s treatment guidelines to the veteran population, identify information constructs that are important to clinicians for supporting the correct treatment decision, and use the findings to develop and pilot test a new tool.

While this project is focused on a specific clinical topic and setting, its approach to providing decision support at the point of care by integrating treatment guidelines, characteristics of the target population, and information needs of clinicians can serve as template for decision support for other disease conditions.

Specific Aims:
• Create and validate a Veterans’ Affairs (VA)-specific risk-stratification rule for fragility fractures. (Ongoing)
• Incorporate the risk-stratification rule into a computerized decision support system for osteoporosis treatment. (Ongoing)
• Pilot the decision support tool for initiating osteoporosis treatment. (Upcoming)
In addition to the research project goals, Dr. LaFleur will further her long-term career goal of identifying and preventing drug-therapy failures in chronic disease populations. Funding from this Mentored Clinical Scientist Research Career Development Award will allow Dr. LaFleur to advance her skills in health services research through structured coursework, regular seminars, and mentoring in the fields of clinical informatics, decision modeling, epidemiologic methods, and statistical approaches.

**2010 Activities:** 2010 activities focused on developing the risk stratification rule to be used with VA coded data. Dr. LaFleur and her team identified a cohort of 2.9 million veterans and completed a significant amount of the programming and analysis to develop the risk stratification models. This included developing a dataset that combines variables related to fracture risk from three VA datasets: the Medical SAS Dataset (all inpatient and outpatient services provided to veterans), the Corporate Data Warehouse (clinical patient care information from VistA), and the Pharmacy Benefits Management Dataset (records of prescriptions dispensed to veterans to identify drug exposures related to risk). The model incorporates outcome data from the Medical SAS dataset for fractures that were treated within the VA system and outcome data from the Medicare-VA dataset to capture fractures that were treated outside the VA system. The team developed and submitted their request for the Medicare data and are awaiting approval.

One change from the original grant proposal was the addition into the rule of bone mineral density screening. While bone mineral density screenings are predictive of fracture risk, they are not codified anywhere in the electronic data. However, Dr. LaFleur and her team used natural language processing software to integrate these screenings into the model as a variable.

Work began on incorporating the risk-stratification rule into a computerized decision support system with the development of case vignettes to identify risk factors and fracture risk constructs that are associated with osteoporosis treatment. In addition, and as part of her career goal for the Mentored Clinical Scientist Research Career Development Award, Dr. LaFleur completed the first year of courses towards her 3-year informatics certificate.

**Preliminary Impact and Findings:** There are no preliminary findings.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Using Health Information Technology to Improve Delivery of HPV Vaccine

**Principal Investigator:** Rand, Cynthia M., M.S., M.D., M.P.H.

**Organization:** University of Rochester

**Mechanism:** PAR: HS09-085: Mentored Clinical Scientist Research Career Development Award (K08)

**Grant Number:** K08 HS 017951

**Project Period:** September 2009 – September 2014

**AHRQ Funding Amount:** $745,995

**Summary Status as of:** December 2010

**Target Population:** Adults, Inner City*, Teenagers, Women*

**Summary:** A vaccine to prevent human papillomavirus (HPV) infection is now recommended for all females aged 11-to-26 years. The vaccine is highly effective if all three doses are received prior to exposure to HPV strains. However, approval and recommendation of a vaccine does not ensure its receipt. Barriers to completion of the three-dose HPV vaccine regimen include health care provider factors (e.g., competing health care priorities during medical visits), and parent or adolescent factors that prevent patients from returning for booster doses.

This project will determine whether the use of electronic patient reminders can shorten intervals between HPV vaccine doses and increase overall rates of completion of HPV vaccination regimen in inner-city settings as compared to practices without reminders. Two health information technology (IT) interventions are planned. The first and primary intervention will be an electronic reminder, delivered by e-mail, text message, or a social networking site, to patients for followup doses of vaccine. The second will use electronic medical record prompts for providers to reduce missed opportunities for immunization. Prompting effectiveness will be measured using a before-and-after study design.

Quantitative interviews with parents of adolescent girls, and adolescents themselves will guide the intervention design. A retrospective cross-sectional analysis of the intervention will be performed in four inner-city primary care practices. Post-intervention rates of missed opportunities for HPV vaccination, intervals between vaccine doses, overall rates of completed HPV vaccination courses, and health maintenance visits will be measured in several intervals at each practice. Data will be analyzed to assess the overall effectiveness of the prompting and patient reminder intervention in reducing missed opportunities and improving vaccination completion rates. The project will also assess rates of health maintenance visits and other vaccinations for adolescents in intervention and comparison practices. Outcomes will be measured at baseline, the electronic patient reminder will then be implemented, and summary statistics will be generated 6, 12, and 18 months after the intervention begins.

**Specific Aims:**

- Measure parent and adolescent preferences for methods of communication with the adolescent’s provider (Ongoing)
- Measure baseline rates of missed opportunities for HPV vaccination, the intervals between HPV
vaccine doses, and the proportion of patients who received one, two, or three vaccinations. **(Ongoing)**

- Develop and implement a health IT-based intervention to reduce missed opportunities, reduce intervals between doses, and increase completion of the HPV vaccination series in inner-city practices. **(Upcoming)**
- Measure post-intervention rates and analyze data. **(Upcoming)**
- Complete educational objectives. **(Ongoing)**

In addition to the specific research project aims, as part of this Mentored Clinical Scientist Research Career Development Award, Dr. Rand will complete the following education objectives: learn health informatics theory and be able to apply it to both clinical decision support for providers and self-management support for patients; become expert in implementing and sustaining quality improvement (QI) projects based in health IT and teach these skills to other health care providers; skillfully implement qualitative research methods and develop advanced skills in the application of quantitative statistical methods; improve career skills by writing sound manuscripts and competitive grants; and networking with leaders in health IT, immunization delivery, QI, and adolescent preventive health.

**2010 Activities:** Dr. Rand completed a retrospective chart review in one practice to build a dashboard and measure HPV vaccination rates. A survey to evaluate patient access to technology and preferences for reaching them was designed and piloted. Institutional review board approval for working with additional practices and the survey was submitted. Significant progress toward the completion of the Dr. Rand’s educational objectives continued.

**Preliminary Impact and Findings:** The project does not have any findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
The Effects of Age, Cognition, and Health Literacy on Use of a Patient Electronic Medical Record

Principal Investigator: Taha, Jessica R., M.S.
Organization: University of Miami
Mechanism: PAR: HS06-118: AHRQ Grants for Health Services Research Dissertation (R36)
Grant Number: R36 HS 018239
Project Period: September 2009 – November 2011, Including No-Cost Extension
AHRQ Funding Amount: $37,800
Summary Status as of: December 2010

Target Population: Adults, Elderly*, Low Literacy

Summary: The use of patient portals of electronic medical records (EMRs) is expanding as patient involvement in disease prevention, management, and decisionmaking is emphasized in the health care system. To date, there has been little usability testing of patient portals, especially with older adult populations. This study will systematically assess the ability of older adults to use the patient portal of an EMR to perform health management tasks and examine how individual characteristics, such as health literacy and cognitive abilities, impact the use of such systems.

Participants will include individuals aged 40-to-85 years with low and high health-literacy levels, as measured by the Test of Functional Health Literacy in Adults (TOFHLA). The specific focus will be on three common health management tasks associated with patient portals: 1) medication management; 2) interpreting laboratory test results; and 3) health maintenance activities. By systematically assessing the relationship between individual characteristics and the ability to use a patient portal of an EMR system, the study will identify the root of usability problems and develop empirically-based interventions to help those who are most likely to face problems interacting with these systems. At the same time, this research should increase the general usability of these systems, which will ultimately benefit all patient populations.

Participants will be given a background questionnaire to gather data including gender, age, ethnicity, educational level, income, health information, medication use, experience with technology, and cognitive battery tests. Participants will also be given the TOFHLA and subjective and objective numeracy tests. Basic information will be provided on how to navigate the EMR record and view its information. Each participant will then use the portal to perform the three aforementioned types of health-related tasks. Following the completion of the tasks, participants will be asked to complete a portal usability questionnaire. At the completion of data collection, brief interviews will be conducted with each participant to get additional feedback on use of the patient portal.

Specific Aims:

• Examine the ability of middle-aged and older adults to use a patient portal of an EMR to perform common health management tasks. (Ongoing)
• Examine the relationships between individual characteristics such as age, cognitive abilities, health literacy, and task performance. (Ongoing)
• Identify usability problems inherent in the use of patient portals and identify design solutions. (Ongoing)

2010 Activities: All tool development was completed and all forms were tested and revised. Cognitive tests were identified and modified. The Web site, which mimics a patient portal, was created and tested. Recruitment was initiated and 95 people had been recruited by the end of the year. Sixty-one people have come in for the required two days. Of the 61, only one participant has been lost to followup.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The project is meeting most of its aims on time. Budget spending is roughly on target.

Preliminary Impact and Findings: The project does not have any findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Creating a Foundation for the Design of Culturally-Informed Health Information Technology

**Principal Investigator:** Valdez, Rupa Sheth, M.S.  
**Organization:** University of Wisconsin Madison  
**Mechanism:** PAR: HS06-118: AHRQ Grants for Health Services Research  
**Dissertation (R36)**  
**Grant Number:** R36 HS 018809  
**Project Period:** February 2010 – January 2012  
**AHRQ Funding Amount:** $34,003  
**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** One approach to confronting racial and ethnic health care disparities has been to develop initiatives to enhance the cultural appropriateness of health care. To date, these efforts have predominantly focused on the cultural tailoring of provider-delivered care, health care systems, and health promotion campaigns. Given the expanding importance of health information technology (IT) used by patients and members of their social network, and the fact that most technology is embedded with strong but unrecognized cultural orientations, expanding health IT design to purposefully include salient cultural dimensions may help reduce these disparities.

The long-term objective of this work is to reduce racial and ethnic health care disparities by creating new, culturally-responsive approaches to the design of health IT for use by patients and members of their social network (e.g., family, friends, neighbors). The goal is to create a foundation for a design strategy that leads to culturally-informed consumer health IT. Consumer health IT has the potential to involve patients and their supporters in the improvement of their health. A concurrent, mixed-methods approach drawing on both anthropological and systems engineering methods will be used to systematically assess culturally diverse patients’ daily routines of health information communication.

The outcome of this study will be a systematically-derived understanding of the daily health information communication routines of individuals of diverse cultural backgrounds. Such an understanding will identify points of similarity and variability and, therefore, where functional standardization may be appropriate and where and what type of tailoring may be necessary. These empirically grounded design considerations may be used to culturally inform the needs assessment, evaluation, and selection phases of the design process.

Two lines of future work will build upon the results of this project. The first will empirically assess the ease of applying these considerations at different stages of the design process. The second will empirically assess the impact of culturally-informed consumer health IT on outcome measures such as usability, use, and satisfaction.

**Specific Aims:**
- Determine the daily routines of health information communication exhibited by patients holding diverse cultural identities. *(Ongoing)*
• Determine what design considerations for consumer health IT result from knowledge of these daily routines. (Ongoing)

2010 Activities: The project team is conducting surveys, interviews, and validation exercises to determine the health information communication routines of culturally-diverse patients. As of December 2010, 20 of the proposed 60 screening surveys; two interviews apiece with 12 of the proposed 30 participants; and four of the proposed six validation exercises were completed. The project team reflected upon and documented the results of these interactions to gain insight into design considerations for consumer health IT. Analysis of these data will begin in 2011.

In addition, the project team has disseminated preliminary findings at conferences, including a paper titled Designing Culturally-informed Consumer Health IT: An Exploration and Proposed Integration of Contrasting Methodological Perspectives, presented at the 2010 Human Factors and Ergonomics Society Conference, and an oral presentation titled To Talk or Not to Talk: Exploring Culturally Diverse Patients’ Health Information Communication Choices at the 2010 American Medical Informatics Association Annual Symposium.

Preliminary Impact and Findings: Preliminary analysis of the data reveals that although some participants shared identification with a single term (e.g., “white”), the ways in which they identified with these terms were often quite different. For example, one individual indicated that she identified as “white,” but only because “they expect me to.” She indicated that she isn’t white by pointing at her skin, but felt that was the box she was expected to check. Diverse identifications highlight the complexity of creating user profiles or segmenting user groups by cultural indicators. In addition, the project team found a clear difference between what participants believe about health information communication and the actual phenomenon. When participants were asked if they believe that their health information communication practices are similar or different to others’, they overwhelmingly stated that they thought that others communicated health information as they did. However, from the data gathered, it is clear that participants often had very different approaches to health information communication. This finding suggests that a “user-centered” design approach may suffer from the same limitations as a “designer-centered” approach if the users integrated into the design process are not representative of the entire population.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Improving Management of Test Results That Return After Hospital Discharge

Principal Investigator: Were, Martin, M.D., M.S.
Organization: Indiana University
Mechanism: PAR: HS09-085: Mentored Clinical Scientist Research Career Development Award (K08)
Grant Number: K08 HS 018539
Project Period: October 2009 – September 2013
AHRQ Funding Amount: $577,880
Summary Status as of: December 2010

Target Population: Adults

Summary: Nearly half of the hospital patients discharged with pending test results experience medical errors related to missed results for those tests. These errors largely arise from poor methods of managing test results and poor communication with the followup providers. Discharge summaries, the main mode of inpatient-to-outpatient communication, remain highly inadequate at documenting tests with pending results at discharge. While the problems related to poor management of test results returning after hospital discharge is widely acknowledged, little has been done to implement and evaluate interventions to improve existing systems.

This project will implement and evaluate two health information technology interventions aimed at improving management of tests with pending results at hospital discharge. The first is a tool to automatically identify tests with pending results at hospital discharge and assist in incorporating these tests into the discharge summary. The second is a modification of an existing clinical-messaging tool (DOCS4DOCS®) to automatically deliver results for pending tests to the followup providers. This work will be conducted at Wishard Memorial Hospital (WMH), a 353-bed urban public hospital on the campus of Indiana University School of Medicine. WMH uses the Regenstrief Medical Record System (RMRS) integrated with the Regenstrief-developed Gopher computerized provider order entry (CPOE) system. All inpatient orders and discharge summaries must be entered electronically via Gopher. The newly-developed tool will deliver pending results to providers through the Gopher CPOE system. Dr. Were and his team will use a combination of randomized controlled studies and surveys to discern the specific effects of each technology on processes of care.

Specific Aims:

• Develop and implement a computerized tool to automatically identify tests with pending results at hospital discharge and assist in the incorporation of these tests into the discharge summary. (Achieved)
• Evaluate the impact of this tool on accuracy of documenting pending tests in discharge summaries (Ongoing)
• Modify an existing clinical-messaging program to enable automatic delivery of returning results for pending tests to the designated outpatient followup providers. (Upcoming)
• Evaluate how the automatic delivery of test results impacts followup providers’ actions and attitudes. (Upcoming)
In addition to these specific research aims, Dr. Were, as part of the Mentored Clinical Scientist Research Career Development Award, will continue his long-term career goal of implementing and evaluating informatics-based interventions that improve quality of care and patient safety. Project funds allow him to acquire advanced skills through structured coursework, regular seminars, and mentoring with leaders in medical informatics, health services research, biostatistics, and implementation research.

**2010 Activities:** The project team completed Java-language programming of the processor, called the Pending Test Processor (PTP), which incorporates pending tests into the electronically-prepared discharge summaries. This system is programmed to allow the Gopher CPOE system to send an HL7 trigger message to the PTP when a discharging provider signs the electronic discharge summary. Upon receiving this trigger message, the PTP identifies tests with pending results by querying the RMRS database. The tests identified through the queries are then delivered via Gopher back to the discharging provider, who can select tests for inclusion in the discharge summary. A study to evaluate the impact of this tool is underway.

**Preliminary Impact and Findings:** The project does not have any findings to date. Evaluations are ongoing.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
Health Information Technology and Improving Medication Use

**Principal Investigator:** Bates, David W., M.D., M.Sc.
**Organization:** Brigham and Women’s Hospital
**Mechanism:** RFA: HS07-004: Centers for Education and Research on Therapeutics (CERTs) (U18)
**Grant Number:** U18 HS 016970
**Project Period:** September 2007 – August 2011
**AHRQ Funding Amount:** $1,999,073
**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** The Centers for Education and Research on Therapeutics (CERTs) program is a national initiative to increase awareness of the benefits and risks of new, existing, or combined uses of therapeutics through education and research. Each CERT supports multiple research projects under the direction of a lead principal investigator.

In 2007, recognizing that information technology (IT) has great potential to reduce medication errors and improve patient safety, the Agency for Healthcare Research and Quality funded the Brigham and Women’s Hospital Health IT CERT program. The Brigham and Women’s Hospital CERT-Health IT team is organized into two “cores”: the Methodology and Data Resources Core, and the Translation and Dissemination Core. These cross-disciplinary cores currently support projects on soliciting information from patients on adverse medication events, using clinical decision support (CDS), evaluating new processes for medication reconciliation post-discharge, and assessing the impact of regional health exchange on medication safety.

Results from these projects will break new ground in determining how current health IT-related interventions can be broadly disseminated. In addition, the Brigham and Women’s Hospital CERT-Health IT team will build and bolster educational tools and programs to assist with therapeutics and health IT.

**Specific Aims:**

- Evaluate the impact of using telephony to ask outpatients identified from electronic health record (EHR) data if they are experiencing adverse effects related to specific medications. (Ongoing)
- Evaluate the impact of clinical decision support and automated telephone outreach on antihypertensive and lipid-lowering therapy in ambulatory care. (Ongoing)
- Evaluate errors arising from implementation of electronic prescribing. (Ongoing)
- Evaluate the impact of implementing a post-discharge ambulatory medication reconciliation intervention. (Ongoing)
- Evaluate effects of multiple vendor-based prescribing systems on medication safety among six Regional Health Information Organizations in New York and Massachusetts. (Ongoing)

**2010 Activities:** The focus of activity for each project is described below.

*Project 1: e-Pharmaco-vigilance: Integrating Patient Reports of Side Effects with Electronic Health Records for Surveillance of Recently Approved Drugs.* The goal of this project is to increase surveillance...
Project 1: Interactive Voice Response System for Patient Monitoring. This project demonstrated the potential of interactive voice response (IVR) systems to actively monitor patients taking recently released Food and Drug Administration-approved drugs. Interactive voice response is linked to a patient EHR to actively monitor patients taking these medications by calling and asking them about their progress using a medication and if they are having any problems. The system is programmed with electronic triggers to e-mail corresponding messages to the physician. The project enrolled approximately 300 to 400 patients per month for a total of 7,755 patients over two years (August 2008 – February 2010). The response rate for followup calls was 70 percent for patients actively taking the targeted medications and with working telephone numbers.

Project 2: A Multi-Modal Intervention to Improve Antihypertensive and Lipid-Lowering Therapy. This project compares the impact of CDS with and without automated telephone outreach (ATO) to patients on the use of antihypertensive and lipid-lowering medications. The project conducted semi-structured informational interviews with primary care physicians to understand care gaps in the treatment of hypertension and hyperlipidemia. A manuscript detailing the qualitative results of the interviews is in final stages of preparation. The team received institutional review board approval and developed the automated telephone script for CDS-supported patient outreach for one arm of the evaluation. Vendor agreements were finalized to begin the ATO outreach. Parallel efforts were employed to identify community practices to engage in this effort.

Project 3: Unintended Consequences of ePrescribing. This project reviewed prescriptions from commercial pharmacies to identify e-prescription errors. The reviews were analyzed to determine the frequency and character of errors and develop recommendations for preventing these errors and other unintended consequences. Investigators also began work on the second aim of the project, studying the impact of ePrescribing on pharmacy workflow.

Project 4: Ambulatory Medication Reconciliation Following Hospital Discharge. In 2007, a post-discharge medication reconciliation module was created within the ambulatory EHR to reduce medication errors. When the trial began in 2008, use of the module was low, so the project team created an active reminder (“pop up”) in the EHR medication screen and a passive reminder in the EHR summary screen. The team compared use of the reconciliation module before and after the reminders were developed. By the end of 2010, over 1,000 clinical providers were enrolled. During the enrollment and followup period, the project team monitored the uptake of the medication reconciliation module and observed an increase in module use over time.

Project 5: Impact of Vendor Systems on Ambulatory Medication Safety. This project compares the impact of electronic prescribing by users in the short term (less than six months) to longer-term users (greater than one year). The project is enrolling providers in rural Hudson Valley, New York and New York City. Provider enrollment was completed in Hudson Valley and five providers in New York City were recruited. The team met with the commercial electronic prescribing vendor to ensure that the prescription data can be captured for the two time periods of interest. The team spent 2010 collecting data.

Project 6: Identification of Decision Support Rules for Dissemination in EHRs. This project is developing medication-related CDS rules for EHRs in inpatient and outpatient settings. The team reviewed a large dataset of adverse drug events involving multiple drugs in community hospitals to build on previous research and develop recommendations to prevent adverse drug events. As the second component of the project, seven sites were visited to assess the EHR and computerized physician order entry system alerts for compliance with human factors principles. Analysis of the data collected during the seven site visits began in 2010. The human factors principles were developed by the research team and are established for use in other systems with visual alerts. They have not yet been applied to clinical information systems.
Preliminary Impact and Findings: Preliminary findings for each project are described below.

Project 1: The project is tracking the percentage of calls that trigger an e-mail response to the provider and, for those e-mails, the percentage that result in direct followup through a phone call, office visit, or discontinuation of the medication. A manuscript describing the system’s design, implementation, and challenges is in press at Pharmacoepidemiology and Drug Safety.

Project 2: An article detailing the qualitative assessment component of the study is in the final stages of manuscript preparation.

Project 3: Preliminary results have characterized the types of errors, error rates across different e-prescribing systems, differences in errors between systems, and range in error rates in areas such as inappropriate abbreviations and omitted duration. Initial findings were presented at the American Medical Informatics Association Annual Meeting in November of 2010 and a manuscript has been submitted for publication.

Project 4: The project team began analyzing the outcomes of using the post-discharge medication reconciliation module by adjudicating medication discrepancies and reviewing potential adverse outcomes. The analysis is pending and a manuscript is in preparation for publication in 2011.

Project 5: The project is completing data collection activities and will perform analysis in 2011. A manuscript detailing the study findings is expected late 2011.

Project 6: A manuscript was recently published in the Journal of the American Medical Informatics Association describing the key human factors principles for consideration in the design and implementation of medication-related decision support systems. Dr. Bates and Dr. Phansalkar discussed their findings on the CERT-Health IT CDS project at the 2010 Med Info meeting. This discussion described the development of content and evaluation criteria for implementing medication-related decision support at various institutions in the United States. The CERT-Health IT CDS project has focused on the development of a starter set of clinically significant rules on medication-related decision support that could be implemented in clinical information systems across health care settings.

Strategic Goal: Develop and disseminate health information technology (IT) evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Knowledge Creation
Computer Automated Developmental Surveillance and Screening

**Principal Investigator:** Carroll, Aaron, M.D.  
**Organization:** Indiana University- Purdue University at Indianapolis  
**Mechanism:** PA: HS07-243: AHRQ Health Services Research (R01)  
**Grant Number:** R01 HS 017939  
**Project Period:** June 2009 – May 2012  
**AHRQ Funding Amount:** $899,183  
**Summary Status as of:** December 2010

**Target Population:** Pediatric*, Persons with Disabilities*

**Summary:** Developmental disabilities affect between 12 and 16 percent of the pediatric population in the United States. “Best practices” guidelines require that children receive appropriate and timely screening and treatment for these disabilities. Electronic computer decision support strategies (CDSS) offer a promising aid for implementing a standardized approach to developmental surveillance and screening. Researchers at Indiana University have developed an electronic CDSS for pediatric practices called CHICA (Child Health Improvement Through Computer Automation) to deliver appropriate guidelines to physicians during the patient visit. CHICA will be modified to incorporate developmental surveillance and screening within the existing practice workflow without requiring additional time of the physician or other office staff. The CHICA CDSS system includes elements such as: 1) pediatric guidelines encoded in Arden Syntax, a common computer language representing medical conditions and recommendations; 2) a dynamic, scan form interface for the user; and 3) a Health Level 7-compliant interface to existing medical record systems.

The proposed work extends the CHICA software by incorporating the 2006 American Academy of Pediatrics (AAP) guidelines into the surveillance and screening algorithm, and evaluates the effect of the CHICA system on developmental surveillance, screening, referral, and early intervention and early childhood services. This evaluation follows a cohort of children with developmental disabilities to compare the proportion of children who undergo developmental screening at 9-, 18-, and 30-month visits at four practice sites, two of which have implemented the CDSS system and two of which have not. This evaluation will identify how implementation of the AAP recommendations into CHICA affects adherence to clinical guidelines. In addition, documentation of long-term outcomes will contribute to knowledge about the impact of early surveillance and screening on child health. Qualitative aspects of child screening surveillance will also be explored. These include elements of the child’s management plan, such as family involvement in treatment decisions and planning, treatment that is continuously modified using data-driven decisionmaking, and whether management strategies build on the strengths of the child.

**Specific Aims:**

- Expand and modify an existing computer-based decision support system (CHICA) to include the 2006 AAP developmental surveillance and screening algorithm. *(Ongoing)*
- Evaluate the effect of the CHICA system on the developmental surveillance and screening practices of four pediatric clinics. *(Ongoing)*


• Evaluate the effect of the CHICA system on referrals for developmental and medical evaluations, and for early developmental intervention and early childhood services. (Ongoing)

• Develop and follow a cohort of children with identified developmental disabilities to look at the end results and effects of developmental screening. (Upcoming)

2010 Activities: The intervention using the CHICA system to facilitate screening for developmental delay at 9-, 18-, and 30-month well-child visits was initiated in 2010. At the technical level, the team made the Ages and Stages questionnaire (ASQ) into a scan document that could be fed into CHICA and scored. The two intervention and two control practices began in July 2010. The grant team collected baseline information on the participating practices, partially through chart review. These practices began surveillance at acute care visits as well as well-child visits. This type of surveillance is a significant change in process for providers. They are used to screening at regular intervals but the concept of screening at any age is new for them. Families typically self-administer the ASQ in the physicians’ waiting rooms. Screening using the ASQ has required some changes in physician workflow. If a family is positively screened, a form is auto-filled to support the referral process to further care and treatment with specialists and other services. The research team has begun the evaluation phase and has started to pull and review clinical charts to assess each practice’s screening and diagnosis practices. In 2011 they will begin giving providers feedback on their screening rates through report cards. The team is also preparing sessions for families when a child receives a diagnosis. The team currently plans to begin publishing the research findings in 2012.

The team is concurrently working on the AAP guidelines for general developmental screening and autism. These guidelines call for a comprehensive screening at the 18-month well-child visit. CHICA was designed to encourage integration and avoid duplication. Because there is need for screening of multiple conditions, there is currently a discussion weighing the various benefits of screening for autism versus general developmental screening.

Grantee’s Most Recent Self-Reported Quarterly Status (as of December 2010): The team is mostly on track with all project milestones. The one area that is somewhat behind the original schedule is the chart review process. Budget spending is on target.

Preliminary Impact and Findings: The team originally planned auto scanning and scoring of the ASQ but found that providers prefer to score the screening tool themselves. Qualitatively, they have been looking at the factors that contribute to use of the CHICA system, such as practice type, and provider characteristics. In general they are finding that younger physicians are quicker to adopt the system.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
## Table 11. Contract Summaries

### One-Time Requests for Proposals

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Colorado Connecting Communities—Health Information Collaborative

Principal Investigator: Davidson, Arthur, M.D., M.S.P.H.
Organization: Colorado Regional Health Information Organization and University of Colorado Health Sciences Center
Contract Number: 290-04-0014
Project Period: October 2004 – January 2010
AHRQ Funding Amount: $5,000,000
Summary Status as of: January 2010, Completion of Contract

Target Population: General

Summary: This project built a prototype data exchange among four health care organizations as a learning laboratory to identify architecture and policy issues the community needs to address to establish a sustainable business model for health information exchanges. The four partners of the Colorado Regional Health Information Organization (CORHIO) project are Denver Health and Hospital Authority, Kaiser Permanente Colorado, The Children’s Hospital, and the University of Colorado Hospital. This project is one of six Agency for Healthcare Research and Quality (AHRQ)-sponsored State and Regional demonstration projects begun in late 2004 and early 2005 to create a State or regional health information exchange.

The CORHIO project uses a robust electronic master patient index (eMPI) that allows records to be matched and shared at the point of care (POC). This system offers authorized emergency room practitioners at the four sites access to radiology reports, laboratory results, prescribed and dispensed medication information, EKG reports, registration information, and problem lists aggregated from all sites. All existing standards from the Healthcare Information Technology Standards Panel were incorporated into the architecture. CORHIO and its partners went live with a demonstration on December 1, 2008.

The project team was able to successfully develop a non-profit, independent entity to promote exchange of health information in Colorado. Policies, procedures, and the technical and legal infrastructure were developed and deployed to allow secure, federated exchange of information between the four large health care organizations over the Internet utilizing Federal standards and protocols to the extent that they existed. A robust eMPI for nearly 2,500,000 registrants (1,400,000 individuals) was developed and much experience gained around how to build and utilize an eMPI.

Project Objectives:
• Facilitate the live exchange of clinical information across four sites. (Achieved)
• Evaluate clinical impact. (Achieved)
• Analyze role of the Medicaid program. (Achieved)
• Develop a sustainability model. (Achieved)

2010 Activities: The project ended in January 2010 during which time the final report was developed and submitted to AHRQ.
**Impact and Findings:** CORHIO’s enterprise MPI (eMPI) is a core component of CORHIO and any health information exchange. Much effort went into assuring the accuracy of linking patient identities across institutions. The process by which partners reviewed potential duplicates identified by CORHIO was important to identifying and resolving critical technical and algorithmic problems. Partners were a key part of increasing the value and accuracy of the eMPI. After optimization, partners indicated that the potential duplicate reports were very valuable and that they would like to continue to receive the reports and provide feedback to CORHIO.

The POC system had limited usage during the production period. Deployment in the emergency departments (EDs) showed that busy ED physicians are less likely to seek any additional information unless extremely accessible and of high priority. There is an indirect relationship between urgency and comprehensiveness. In an unpublished study conducted earlier by Dr. Lisa Schilling at The Children's Hospital, primary care physicians were much more likely (20 percent) to consider data or information missing than do ED physicians (2 percent). The initial CORHIO effort was to bring data to the ED providers. Through a focus group session, their primary data needs were electrocardiograms for adults and radiographic images for children. The POC system used what was available from the partners, where a few systems offered electrocardiograms and only radiology reports were available. Busy ED doctors found the process of login and query too time consuming, and maintenance of passwords too cumbersome. They wanted an automated interface that retrieves data without any thought or effort. However, auto-population of an electronic medical record with external data was not within the scope of the project.

While the process of aggregating data into usable information was shown to be feasible, the deployment within a busy ED environment might have shown less impact than other care environments would potentially show. The role of an ED physician is to make time critical decisions on a given acute issue. By necessity, these providers do not function as primary care physicians and thus do not review all parameters for chronic diseases or preventive health efforts. Their focus is instead only on the presenting complaint by the patient. Access to comprehensive data therefore may not be as critical in the ED care setting as it might be in others.

During interviews, several users described instances in which use of the POC system improved the quality or efficiency of care. The interface was intuitive but the patient search function could have been improved. The relatively short password lifespan of 3 weeks was a definite impediment to use. An area where CORHIO began to explore remedies was in trying to leverage another system’s authorization and authentication procedure to identify a user within CORHIO. The security assertion markup language (SAML) is a tool that could support easier user access without the laborious password distribution process. An automated password reset function based on rigorous authentication procedures used within the federated environment should be explored for deployment. Rather than having an end-user initiate all data searches (i.e., login, confirm compliance with privacy/security, enter patient demographic information, confirm and select results from identity search, and then launch the data aggregation process) the process should be automated. For example, a registration admission/discharge/transfer message (e.g., a patient is now present at a partner institution) received by CORHIO could tell the provider if additional information has been found or even seamlessly incorporate it into the electronic medical record. Integration of CORHIO partner clinical information systems (e.g., automated patient search and then indication of available external data) would have markedly increased use. Ongoing promotion and support of the POC would also have kept service in the mind of potential users.
The iterative process of building policies required significant interaction between the technical workgroup and policy committee. To assure compliance with CORHIO policies, an online tutorial addressed training regarding system policy requirements, appropriate use, patient consent, and authentication standards had to be completed by system users. Health information exchange privacy and security assurances including automatic auditing was a CORHIO requirement. These requirements preceded but are consistent with updated HIPAA regulations for health information exchange systems.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Project Summaries

State and Regional Demonstrations in Health Information Technology

**Principal Investigator:** Frisse, Mark, M.D., M.S., M.B.A.

**Organization:** State of Tennessee

**Contract Number:** 290-04-0006

**Project Period:** September 2004 – September 2010

**AHRQ Funding Amount:** $5,000,000

**Summary Status as of:** September 2010, Completion of Contract

**Target Population:** General

**Summary:** Health care providers can make better care and treatment decisions when they have as much information (laboratory tests, medical history, medicines, etc.) as possible about a patient’s health. The MidSouth eHealth Alliance (MSeHA or the Alliance) implemented and evaluated a regional data-sharing and interoperability service for health care entities in the Greater Memphis area, which encompasses counties in southwest Tennessee, northern Mississippi, and northeastern Arkansas. The MSeHA is a nonprofit organization that works in conjunction with the Vanderbilt University Regional Informatics Team. Stakeholders include patients, primary care providers, specialty care providers, inpatient and emergency room care teams, health systems, safety net clinics, and State and local governments. The Alliance enables providers to review medical information from several organizations quickly while restricting access to a patient’s medical information to current and direct care providers. This project is one of six Agency for Healthcare Research and Quality-sponsored State and Regional demonstration projects begun in late 2004 and early 2005 to create a State or regional health information exchange (HIE).

MSeHA has gained State and national recognition for its approach to privacy, security, and confidentiality. Its data-sharing agreements, policies, and operating committee infrastructure have been adapted by more than 30 organizations and States. The Alliance began with a focus on improving the quality of patient care while maintaining or decreasing the cost of care delivery. This project expands the initial focus by evaluating use and adoption, usability, reduction of duplicate tests, impact on specific complaints (e.g., chest pain), workflow, and financial impact. The lessons learned and work products are being applied across the State.

**Project Objectives:**

- Facilitate the exchange of clinical data elements among providers in a three-county region with a population of about 1 million. **(Achieved)**
- Leverage the Vanderbilt technical architecture to initiate the exchange and eventual transition to an independent platform. **(Achieved)**
- Expand the number of participating organizations to remaining safety net providers and primary care ambulatory providers. **(Achieved)**
- Develop a business model for sustainability. **(Achieved)**
**2010 Activities:** Since 2005, the nonprofit MSeHA has governed and managed HIE services among 14 major health care provider organizations in the Memphis, Tennessee metropolitan area. Information available from participating organizations varies slightly among organizations. All major hospitals provide hospital discharge summary notes, laboratory data, pathology reports, radiographic reports, select transcribed notes, and a range of other clinical and administrative documents. Other participating organizations provide demographic information, registration information, and a limited number of clinical data types. Clinicians began accessing HIE data in emergency departments in May 2006 and later obtained access on hospital wards and in ambulatory clinics. As of October 2010, clinicians had access to over 7.5 million encounter records on 1.7 million patients, 4.9 million chief complaints, 45 million laboratory tests, 5 million radiology reports, and 2.1 million other reports and documents. Patients are offered the chance to “opt out” from HIE participation at the time of each encounter at participating hospitals and clinics.

**Impact and Findings:** The overarching findings from this study suggest that both the process and technical models can make substantial contributions to national HIE. The Vanderbilt-based architecture was shown to be a robust, scalable, and very inexpensive model for HIE. As a wider array of ambulatory-based electronic health records, laboratory devices, and other technologies are integrated there will be a convergence of issues regarding data centralization, privacy considerations, and data sharing provisions. Therefore, future HIE efforts will realize even greater cost benefits. This broader integration will foster more effective care coordination and allow for demonstration of care impact across entire populations and not just those who seek hospital or emergency department care. Additional findings will be forthcoming in future publications.

**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
### An Evolving Statewide Indiana Information Infrastructure State and Regional Demonstration Project—Indiana Network for Patient Care

**Project Summaries**

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**Target Population:** General

**Summary:** Indiana is using established local and regional health information initiatives, including the Indiana Network for Patient Care (INPC), to develop the electronic health information infrastructure across the entire State. The INPC, an operational health information exchange (HIE) in central Indiana, is one of six Agency for Healthcare Research and Quality (AHRQ)-sponsored State and Regional demonstration (SRD) projects begun in late 2004 and early 2005 to create State or regional HIE. The SRDs use a variety of approaches (e.g., technical, business, and governance models) to support data sharing and interoperability. Each is funded to analyze the role of the Medicaid program, evaluate their project, and develop a sustainability plan. The INPC HIE includes an array of participants and members: physicians, hospitals, ambulatory practices, laboratories, radiology centers, health plans, State and county health departments, and immunization registries. The Regenstrief Institute, acting on behalf of the participants, created and operates the exchange and helped create the Indiana Health Information Exchange (IHIE) to establish a sustainable business model to support the INPC.

The INPC has operated since 1995, providing population-based, longitudinal, structurally coded, and text patient data on citizens of Indiana. The INPC coverage is most complete for the Indianapolis Metropolitan Statistical Area (MSA), a 3,200 square-mile region in central Indiana with 1.7 million residents, but continues to expand to cover all 6.4 million residents of Indiana. As of the end of 2010, the INPC stored data for 23 million unique patient registrations, representing more than 11 million unique individuals. The system contains clinical data for nearly the entire population of the Indianapolis MSA, patients throughout Indiana, and patients outside the State.

The INPC captures data from many sources, including hospitals, physician practices, public health departments, laboratories, radiology centers, pharmacies, pharmacy benefit managers via SureScripts, and payers. Sources such as hospitals and physician practices provide many types of data, including laboratory, radiology, and pulmonary function test results; cardiology diagnostic results; gastroenterology study results; procedures performed; diagnoses assigned; transcribed reports (admission, operative, discharge); and inpatient, outpatient, and emergency department encounters. As of August 2010, more than 19,000 clinicians across Indiana exchange data through the system.

**Project Objectives:**

- Assess the effects of HIE on productivity, service utilization, patient quality, safety, satisfaction, and ongoing marginal costs. *(Ongoing)*
Create a sustainable business and funding model to assure the HIE’s long-term survival by providing services built on top of the HIE, such as clinical messaging, quality improvement, and public health services. **(Achieved)**

**2010 Activities:** The INPC continues to grow and support clinical care, public health surveillance, quality measurement, coordination of care, and clinical research. In 2010, 14 hospitals joined the network, and work began to incorporate Golden Living extended care facilities. By the end of the year, the INPC contained more than 11 million unique patients, 600 million encounters, and 3.5 billion rows of structured results. Providers continue to access the INPC for care in a variety of settings including pre-hospital care in ambulances, emergency departments, inpatient settings, mass sporting events, and physician offices. The project team began to track and share the level of participating providers’ utilization of the data with the participating facilities. The level and intensity of usage continue to increase. Quality measures for 5.3 million individuals are now generated monthly. Participating providers and payers receive data on these measures, which physicians use to receive millions of dollars in incentives from payers. The Quality Health First® program, which relies on INPC data, had nearly 1,500 participating primary care physicians at the end of 2010.

The team is working to expand the use of the flows of information in the INPC to enhance coordination of care. Based on a successful pilot project with one payer, they are working to deliver notifications about relevant care events to care coordinators hosted by payers. Dozens of projects utilize INPC data, with appropriate patient consents and institutional review board reviews for health services research, clinical effectiveness research, clinical trials recruitment, and translational research. A notable example is the Observational Medical Outcomes Partnership in which the team is examining the methodological underpinnings of utilizing observational data for research. Finally, in 2010, the team undertook a major contractual and administrative re-organization of the INPC. A new contractual model to accommodate the growth and evolution of the INPC was developed and is being implemented. In addition, the team is re-organizing the management committee to accommodate the larger number of participants and to incorporate a representative model for the committee.

**Impact and Findings:** Preliminary findings from the study examining barriers to expanding HIE indicate that many stakeholders are still not well-informed about HIE. Small hospitals report that two major reasons for non-participation are financial concerns and lack of IT infrastructure. Several HIE participants were concerned about data confidentiality. INPC is still seeking other data sources, such as home health workers and nurse case managers, as well as seeking to extend services.

**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use

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*This objective was not completed prior to conclusion of the funding period but is still targeted for completion.*
Delaware Health Information Network

**Principal Investigator:** Perez, Gina B., M.P.A.

**Organization:** State of Delaware

**Contract Number:** 290-05-0012

**Project Period:** September 2005 – September 2011

**AHRQ Funding Amount:** $4,700,000

**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** The Delaware Health Information Network (DHIN), a public-private partnership that received Agency for Healthcare Research and Quality (AHRQ) funding in October 2005, implemented a real-time electronic method for health care providers to obtain information about their patients. This project is one of six AHRQ-sponsored State and Regional demonstration projects that began in late 2004 and early 2005 to create a State or regional health information exchange (HIE).

The DHIN exchanges data among hospitals, reference laboratories, physician practices, and public health agencies through the State. Partners include consumers, physicians, hospitals, businesses, payers, government agencies engaged in health care, and reference laboratories.

The DHIN board of directors is comprised of diverse organizations representing the primary stakeholders of HIE. They include consumers, physicians, hospitals, health plans, business, higher education, and State government agencies responsible for population health, information technology, and the State budget.

**Project Objectives:**

- Improve care of patients served by Delaware’s health care system, and reduce medical errors associated with inaccurate or incomplete information available to providers. *(Ongoing)*
- Reduce the time and financial costs of HIE by reducing the complexity of current distribution methods and increasing use of electronic means. *(Ongoing)*
- Improve communication between health care providers and patients to provide appropriate, timely care that is based on the best available information. *(Ongoing)*
- Reduce the number of duplicative tests and expedite the reporting of consultant opinions and tests/treatments between specialists and the referring physicians. *(Ongoing)*
- Improve the efficiency and value of electronic health record (EHR) systems in physicians’ offices, and assist physicians that do not have an EHR to better organize and retrieve test results. *(Ongoing)*

**2010 Activities:** In June, DHIN secured approval from the Delaware General Assembly to establish itself as a public, nonprofit instrumentality of the State, with all the rights and privileges thereof. This change in the governance structure allows it to be more responsive to rapidly changing market conditions and establishes DHIN as Delaware’s State-sanctioned HIE. DHIN staff completed a medication history demonstration program using a select group of pain management, hospital-based, and family practices. Based on feedback from the demonstration participants, modifications to the medication history function are under development and are expected to be offered to all users in 2011. Transcribed reports from a
subset of participating hospitals were made available to DHIN users in August, and a fourth hospital system was added to the list of participating data senders in November. Project staff continues to develop evaluation and sustainability plans and certify EHR vendors with interfaces to DHIN.

**Preliminary Impact and Findings:** As of late 2010, DHIN had enrolled nearly 5,000 users at 323 practices around the State. Nearly one-third of these participating practices receive clinical results and reports exclusively through DHIN. The four hospitals systems participating in DHIN account for more than 80 percent of hospital admissions in the State. DHIN’s participating hospital systems and reference labs, including LabCorp, Quest, and Doctors Pathology Services, contribute data on more than 90 percent of the laboratory tests in the State.

Anecdotal information is the basis for the current impact evaluation of DHIN. This information has established that DHIN saves time and creates efficiencies at the practice level (both automated and paper-based), improves patient outcomes, saves money in the emergency department, and supports transitions of care among in- and outpatient settings. Participating hospitals have determined that automated public health reporting through the DHIN saves time and infection control resources. A formal evaluation will be conducted in 2011 to understand the value and benefit of the DHIN for each stakeholder group, including physician practices, hospitals, laboratories, payers, consumers, and State agencies. The evaluation aims to measure how the DHIN impacts efficiency, patient safety, and health care costs.

**Strategic Goal:** To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Implementation and Use
Improving Communications Between Health Care Providers via a Statewide Infrastructure: Utah Health Information Network Clinical State and Regional Demonstration Project

Principal Investigator: Root, Jan, Ph.D.
Organization: Utah Health Information Network
Contract Number: 290-04-0002
Project Period: September 2004 – September 2011, Including No-Cost Extension
AHRQ Funding Amount: $5,000,000
Summary Status as of: December 2010

Target Population: General

Summary: The Utah Health Information Network (UHIN) is a coalition of health care insurers, physicians, hospitals, laboratories, local health departments, health centers, State agencies, and other interested parties that have come together to reduce health care costs and improve the quality of care through the use of electronic data interchange. In 2008, the Utah legislature passed a law that gave the Department of Health (DOH) the authority to adopt standards for exchanging medical data. The DOH decided to leverage UHIN’s expertise to exchange clinical data.

This project is one of six Agency for Healthcare Research and Quality (AHRQ)-sponsored State and Regional demonstration (SRD) projects begun in late 2004 and early 2005 to create a State or regional health information exchange. UHIN’s goal is to implement statewide information and communication technologies to facilitate the exchange of clinical data among its members. In the early stages of the project, UHIN completed the initial implementation of a statewide clinical health information exchange built upon existing administrative exchange infrastructure and contracts. The first 4 years of UHIN’s AHRQ contract were dedicated to building coalitions, developing infrastructure, identifying and engaging in dialogue amongst disparate UHIN partners, developing UHIN self-governance policies and procedures, and determining technological and administrative requirements needed to support the UHIN. The enhanced infrastructure, which allows initial exchange of clinical information through UHIN, is a utility for direct entry of claims, eligibility inquiries, and other health care transactions. When, in 2009, UHIN determined that a comprehensive solution for clinical information exchange was necessary, they contracted with the Axolotl Corporation, a provider of health information exchange services, to provide the technical infrastructure for a clinical health information exchange (cHIE). UHIN will update its electronic commerce agreement and create a cHIE addendum that links the responsibility to comply with liability requirements to ensure proper use of member’s clinical data.

Project Objectives:

• Develop a novel exchange of laboratory and prescription drug data among unrelated entities. (Achieved)
• Conduct analyses of the role of the Medicaid program. (Achieved)
• Provide an evaluation of the project. (Ongoing)
• Implement a sustainability model. (Ongoing)
• Community implementation of clinical data exchange utilizing the expanded cHIE infrastructure
that includes an “Electronic Medical Record Lite,” a master patient index, and virtual health records-query functionality. (Ongoing)

2010 Activities: Over the course of the year, the cHIE was rolled out to communities across the State. Four data source sites are sending a combination of patient demographics, general and microbiology laboratory results, and transcription and radiology reports. By the end of 2010, data sources were sending more than 140,000 monthly clinical messages to the cHIE. Eleven user sites are set up in production and two different electronic health record (EHR) systems are exchanging information with the cHIE.

Since the beginning of the cHIE, the default consent model has been an “opt-out” model, where, by default, all patients’ clinical records in the cHIE are available for query by authorized providers. By the end of 2010, the default consent model was being re-evaluated. Changing the default patient consent model to “opt-in,” where, by default, all patients’ clinical records are unavailable for query by authorized providers until the patient has consented to allow access, may delay cHIE adoption and implementation because of the time need to collect consent.

AHRQ has granted UHIN a 1-year no-cost extension to complete the second part of the evaluation regarding cHIE adoption and implementation. Most of the evaluation participants have completed an initial baseline workflow analysis prior to their participation in the cHIE. A post evaluation will be completed for these participants in 2011. The evaluation, being conducted by HealthInsight, will determine the cHIE impact to these sites as it relates to workflow and adoption.

UHIN is working with the Veterans Affairs (VA) to exchange continuity of care documentation between the VA and rural hospitals in Utah by connecting UHIN to the National Health Information Network. This pilot should be completed in 2011. After completing the pilot, the ultimate goal is to enable UHIN to become the statewide VA exchange in 2012.

Preliminary Impact and Findings: Utah has relatively high EHR penetration, especially in larger clinics. Many providers have already interfaced their EHRs with hospitals and laboratories, or are in the process of doing so. It is unclear at this time if and when these providers will change to receive their data via cHIE as opposed to their direct interfaces with labs and hospitals.

Providers have expressed the most interest in the ability to query patients’ clinical records across various entities. The expected change from an “opt-out” to an “opt-in” consent model will necessitate a significant shift in the cHIE marketing strategy with providers, data sources, and patients.

Several new data sources are contributing information to the cHIE. The consistent implementation of the HL7 Standard across entities can be challenging due to system limitations and interpretation of the HL7 Standard and the standard vocabularies used or not used. The use of UHIN Standards and Specifications found in the statewide implementation guides could provide consistent HL7 messaging across cHIE and will reduce the time needed to map non-standardized data sources. However, full adoption of these standards will require ongoing mapping and will take time.

Strategic Goal: To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use
Rhode Island Statewide Health Information Exchange—State and Regional Demonstration Project, currentcare

Principal Investigator: Zimmerman, Amy, M.P.H.
Organization: Rhode Island Department of Health
Contract Number: 290-04-0007
Project Period: September 2004 – June 2011
AHRQ Funding Amount: $5,000,000
Summary Status as of: December 2010

Target Population: General

Summary: The Rhode Island Department of Health is collaborating with the Rhode Island Quality Institute (RIQI) and stakeholders across the State to develop, implement, and evaluate an interconnected statewide health information system with a master patient index (MPI). The aim of the system is to provide information to clinicians and patients when and where it is needed. The Rhode Island health information exchange (HIE) system, known as currentcare, is intended to evolve into an interconnected statewide health information network that will improve the quality, safety, and value of health care services and support critical public health needs for the broader Rhode Island population. This project is one of six Agency for Healthcare Research and Quality (AHRQ)-sponsored State and Regional demonstration (SRD) projects begun in late 2004 and early 2005 to create a State or regional HIE.

The project is intended to design, develop, test, deploy, and evaluate the initial phase of a secure and reliable HIE system governed by RIQI, the State-designated health information organization (HIO). Initial types of data to be shared as part of the HIE during the project period include laboratory results and medication history. Initial end users will be long-term care facilities, community health centers, private providers, and hospital emergency departments. Other data-sharing partners, end users, and data types (including interfaces with electronic health record systems) will be added as quickly as possible.

Currentcare is being implemented in accordance with the Rhode Island HIE Act of 2008, which stipulates stricter privacy and confidentiality protections than other State and Federal health information privacy laws. The rationale, impact, and results of this law on HIE system implementation have been a major focus of the project evaluation. Currentcare is expected to go live in mid-2011.

Project Objectives:
• Improve the quality, safety, and value of health care in the State of Rhode Island through a sustainable statewide HIE system. (Upcoming)
• Incorporate a MPI into the HIE to locate longitudinal patient health information from numerous data-submitting partners statewide. Design the HIE so that consumers will be allowed to control access to their data. (Achieved)
• Implement the capability to present data from various sources in an integrated, patient-centric manner using a common user interface. (Upcoming)
• Transition all operating, management, and governance responsibility of the HIE to a community-based regional HIO. **(Achieved)**

**2010 Activities:** Project stakeholders worked with the technical vendor team to finalize the first version of currentcare for testing and a security audit. Technical development included addressing issues discovered during testing. In addition, a major effort was made to complete the transition of responsibility for implementing and operating the HIE system from the Department of Health to RIQI, as the State’s designated entity, including system software, hardware, and the hosting environment. This work was done amidst recovery from unprecedented floods in Rhode Island which completely destroyed the data center that housed currentcare. Software recovery took longer than anticipated and contributed to major delays in user acceptance testing. Further, all hardware required replacement and a new data center and hosting contractor were identified. RIQI continued efforts to obtain consumer registration (enrollment) in currentcare using various strategies including community outreach and education, training and development among providers, and paper-based and electronic marketing strategies. Enrollment efforts initially targeted Medicaid beneficiaries and were expanded to include patients at the site of care and in long-term care facilities. By the end of the year, more than 100,000 patients had been enrolled in currentcare.

In early 2010, RIQI was awarded three grants from the Office of the National Coordinator for Health Information Technology that are expected to facilitate continued near term growth of the statewide HIE system. In May 2010, the project team participated in the final “Capstone” meeting with fellow AHRQ-sponsored SRD projects to share lessons learned and reflect on the future direction of the initiatives. While currentcare remained in the user acceptance testing phase in late 2010, it is anticipated to be completed, along with a security audit, and ready for go live in a pilot implementation in mid 2011. Efforts continued to finalize the data-sharing agreement, which will be signed once the system is ready to go live.

**Preliminary Impact and Findings:** The project’s Final Evaluation Report was submitted to AHRQ which included an evaluation of the benefits and challenges of the Rhode Island community governance and patient consent approaches. In the report, Rhode Island’s decisions relating to community involvement and privacy protections are studied and their impact on Rhode Island’s progress is analyzed. The outcome of focus group evaluation of policymaking processes and decisions confirmed an overall broad-based sense of community pride in the work carried out to date to build a statewide HIE system. The focus group evaluation also reflects stakeholders’ general agreement with the community collaboration approach and the consent policy direction that was undertaken.

In addition, a study of the currentcare enrollment strategies and results in long-term care facilities was included. For nursing homes, the value of and need for the HIE system is perceived to be high, however, the nursing home environment has both significant advantages and challenges for enrolling residents. The nursing home study describes how efforts to enroll nursing home residents in currentcare met with varying success and identifies key attributes for success in engaging long-term care facilities.

It is hoped that the project’s contribution to the HIE body of knowledge can be used to emphasize the need to understand and actively manage the complex relationship between the propensity for change in social and health systems and the conditions required for acceptance of technology as a tool for progress in a given community.
Strategic Goal: To develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Implementation and Use
Clinical Decision Support Consortium

Principal Investigator: Middleton, Blackford, M.D., M.P.H., M.Sc.
Organization: Brigham and Women’s Hospital
Contract Number: 290-08-10010
Project Period: March 2008 – July 2011
AHRQ Funding Amount: $3,750,000
Summary Status as of: December 2010

Target Population: Coronary Artery Disease, Diabetes, Hypertension

Summary: Despite overwhelming evidence of clinical decision support’s (CDS’s) effectiveness, only a small number of academic medical centers and integrated delivery networks account for the bulk of CDS research and development. Wider CDS adoption has been limited by a variety of social, economic, and technical issues, including: a lack of widely adopted standards for representing and sharing clinical knowledge in a computable form; difficulty developing clinical practice guidelines that can be readily and unambiguously translated into a computable form; absence of a central repository or knowledge resource where computable guidelines can be stored and shared; challenges integrating CDS into the clinical workflow; and limited understanding of organizational and social issues relating to CDS.

As evidenced by sites where CDS is pervasive, these barriers are surmountable. The biggest challenge to fostering widespread CDS adoption is documenting, generalizing, and translating the experience from these advanced sites to broader community settings. To address this challenge, investigators from Brigham and Women’s Hospital, Harvard Medical School, and Partners HealthCare Systems (PHS) formed the Clinical Decision Support (CDS) Consortium in collaboration with the Regenstrief Institute, the Veterans Health Administration, Kaiser Permanente Northwest Research Group, General Electric Healthcare, Siemens Medical Solutions, Mayo Clinic, NextGen, University of Texas School of Biomedical Informatics, Oregon Health and Science University, Mid-Valley Independent Physicians Association, and University of Medicine and Dentistry of New Jersey.

The goal of the CDS Consortium is to assess, define, demonstrate, and evaluate best practices for knowledge management (KM) and CDS in health information technology (IT) across multiple ambulatory care settings and electronic health record (EHR) technology platforms in pursuit of widespread CDS adoption. The CDS Consortium is developing a series of service-oriented CDS interventions focused on diabetes, coronary artery disease, and hypertension screening. In the first two years of the project, the team developed the service-oriented CDS interventions and piloted them in four ambulatory sites in Massachusetts. In the next few years, the team will expand the interventions and continue to gather data and develop best practices.

Project Objectives:

• Assess and define best practices for knowledge management and CDS in ambulatory care. (Ongoing)
• Define a novel, practical knowledge representation scheme that allows users to access knowledge in a manner that facilitates the translation of knowledge into CDS within EHRs. (Ongoing)
• Build a prototype national knowledge repository to support access and use of knowledge artifacts and collaborative knowledge engineering. (Achieved)
• Build publicly-available Web services to provide remote CDS. (Achieved)

• Build end-user CDS dashboards depicting user compliance with CDS and provide feedback to knowledge engineers building the CDS knowledge artifacts and Web services on the efficacy of the CDS. (Achieved)

• Coordinate overall CDSC evaluation activities. (Ongoing)

• Demonstrate the feasibility of a service oriented architecture-based approach through multisite, multivendor demonstration projects. (Ongoing)

• Disseminate results through a variety of traditional channels. (Ongoing)

2010 Activities: The CDS Consortium team continued to pursue research and development through the following project teams from institutions across the U.S: the Knowledge Management Lifecycle Assessment Team (KMLA); the Knowledge Translation and Specification (KTS) Team; the Knowledge Management (KM) Portal Team; the Recommendations Team; the Service Team; the Demonstration Team; the Dashboard Team; the Evaluation Team; and the Content Governance Committee team. Each team made extensive progress on their goals completing a series of deliverables, including the completion of the beta version of the KTS stand-alone browser-based knowledge authoring tool; the go-live of the eRoom and KM portal; the development of the KM portal user assessment tool; the finalization of recommendations for Healthcare Information Technology Standards Panel, Certification Commission for Health Information Technology, and clinical content developers; the start of a trial of the CDS service in the production environment; the release of the enterprise clinical rules service to production; finalized data specifications for the project evaluation; a “lessons learned” document from the implementation in PHS’s Longitudinal Medical Record; and the go-live of the two PHS CDS dashboards.

Dissemination activities in 2010 included a presentation of results at a technical expert panel meeting in Washington, DC, and at the Guidelines International Network meeting in Chicago, IL. A paper on themes in CDS was submitted to the Journal of the American Medical Informatics Association (JAMIA); the KTS team also submitted their work on the multi-layered knowledge representation framework and evaluation study to JAMIA. Additionally, a paper describing KMLA’s rapid assessment process was submitted to Methods of Information in Medicine.

Preliminary Impact and Findings: Lessons learned from the teams and projects are outlined below.

KM Team: The team discovered that each external CDSC member must do a significant amount of preparation work before integrating the CDSC content. It is critical that KM be included in the discussions with the CDSC members from the beginning. In addition, the Centers for Medicare and Medicaid Service’s meaningful use standards are causing many delays as PHS rapidly transitions from existing systems to new systems that are certified for meaningful use.

KTS Team: The team’s assumptions about building a Web-based editing tool were invalidated by legal concerns. This suggests that a wider review of requirements and specifications is necessary early in the development process.

KMLA Team: The team found that the modified rapid assessment process works for clinical knowledge vendors. Clinical knowledge vendors are, in terms of informatics skills and knowledge, better prepared than anticipated.
**Demonstration Team:** The team found that despite similar standards and terms, differences in how terms are mapped and used persist, making the process of mapping burdensome. Integration of CDS into the workflow has to be customized by site due to the differences in the interfaces. Communication across health IT project silos is necessary to ensure that interdependencies are managed and all projects are successful.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Guidelines into Decision Support

Principal Investigator: Shiffman, Richard N., M.D., M.C.I.S.
Organization: Yale University
Contract Number: 290-08-10011 20
Project Period: March 2008 – February 2012
AHRQ Funding Amount: $2,500,000
Summary Status as of: December 2010

Target Population: Chronic Care*, Obesity, Pediatric

Summary: The Guidelines into Decision Support (GLIDES) project supports the development, implementation, and evaluation of demonstrations that advance the understanding of how to best incorporate computerized clinical decision support (CDS) into health care delivery at ambulatory care sites. GLIDES is led by staff from the Yale School of Medicine’s Department of Pediatrics and the Center for Medical Informatics and is assisted by clinical and information technology (IT) staff from Nemours, a health system for children, and Yale New Haven Hospital. GLIDES CDS demonstration tools have been integrated into GE’s Centricity and Epic’s EpicCare at selected primary and specialty clinics within the Yale New Haven and Nemours health systems. These two systems are Certification Commission for Health Information Technology-certified. A combination of quantitative and qualitative evaluation methods is being used to determine the project’s results and major findings. The overall goal of the project is to recommend methods to assist clinical organizations across the country with the efficient and effective implementation of CDS.

A centerpiece of GLIDES strategy is the Guideline Elements Model (GEM). GEM is an XML-based knowledge model for guideline documents that incorporates a set of more than 100 tags to categorize guideline content. GEM provides a bridge between the process of knowledge discovery and synthesis and CDS implementation, and forms the backbone of tools that translate narrative guidelines into structured knowledge that can be implemented consistently.

Project Objectives:

• Implement evidence-based guideline recommendations that address prevention of pediatric obesity and chronic management of asthma. (Achieved)
• Apply the GEM and associated tools that facilitate the development of executable code to systematically and replicably transform the knowledge contained in these guidelines into a computable format. (Achieved)
• Deliver the knowledge via CDS to ambulatory sites that employ the Centricity electronic health record (EHR) at Yale and EpicCare at Nemours. (Achieved)
• Evaluate the fulfillment of these goals and the effectiveness of the decision support tools in improving the quality of health care. (Achieved)
• Disseminate the findings and lessons learned via a variety of modalities. (Ongoing)

2010 Activities: Upon achievement of many of the project objectives set forth at the beginning of the project, the GLIDES team established additional project objectives in 2010, including the following:
• Use systematic and replicable processes.
• Continue to design, develop, implement, and demonstrate guideline-based CDS.
• Focus on new guidelines and implementation partnerships.
• Enhance and improve the CDS already produced at Yale and Nemours.
• Recognize the critical importance of transparently developed and clearly stated guideline recommendations for effective implementation, work closely with guideline developers to provide tools and guidance to improve guideline development and reporting processes.
• Update the GEM and increase GEM adoption nationally and internationally.
• Continue evaluation of both existing and newly developed CDS implementations.

The GLIDES team worked with two national guideline development organizations, the American Academy of Pediatrics and American Academy of Otolaryngology-Head and Neck Surgery, to design, implement, and pilot processes and tools intended to make guidelines clearer and easier to implement. These tools are now being refined and enhanced. The team also worked with four leading hospital organizations, including Yale New Haven Hospital, Nemours, Geisinger, and Children’s Hospital of Philadelphia (CHOP), to provide tools and methods for the implementation of CDS. In earlier phases of the project, four separate CDS applications for obesity and asthma were designed, built, and implemented in primary care and specialty settings. In 2010, these initial CDS applications were enhanced at Yale and Nemours. At Yale, this included a formal evaluation of usability and the piloting of an iPad-enabled data capture front-end system for their specialty CDS system. This is a major and potentially transformative change to the way CDS is delivered for Yale pulmonologists, and it will be pursued further in 2011. Both Geisinger and CHOP have designed and performed initial testing of new CDS applications that will be implemented and evaluated in future years.

An extensive literature review on experience and feedback from the various national and international organizations that have used GEM for knowledge transformation was conducted. Based on this feedback and input from GLIDES partners and other CDS contractors, GLIDES designed and implemented improvements to GEM and its related guideline implementation tools. Lastly, the project team participated in a range of dissemination activities, meetings, and presentations, and prepared, submitted, or published nine academic papers that detailed GLIDES results in various areas.

Preliminary Impact and Findings: The experience of GLIDES’ four implementation partners demonstrates that transitioning from recommendations expressed in statement logic to functional decision support is a complex, multifaceted process. Several groups offered guidance for successful implementation, and an evolving set of considerations represents the current approach.

Among the preliminary findings, the GLIDES team discovered the importance of making sure that processes, methods, and tools intended to aid implementation of CDS operate within the context of an organization’s in-place infrastructure when designing and implementing IT-enabled capabilities. CDS-specific processes, methods, and tools must be adaptable to an organization’s in-use system. Each GLIDES implementer took a slightly different approach to bridging the structured knowledge specification outputs from GEM to their own processes and tools for designing changes to EHR systems. These differences in bridging techniques reflect differences in the guidelines being implemented, in the systems development practices of each organization, and in the technical infrastructure being used for the EHR.
There is also tension between centrally-specified implementation considerations and the reality of local-level capacity and necessity. A cornerstone of decision support design is to involve end-users in the development of the tools and systems they will use. Systems that do not accommodate or effectively reengineer workflow are destined to fail. Local workflow and barrier analysis is necessary to demonstrate decision support origins. Similar considerations will also dictate to whom decision support should be addressed.

GLIDES views decision support as a variety of formats, not simply alerts and reminders. More robust CDS requires a variety of modalities to solve different problems. In developing a decision support intervention, GLIDES has also found that classification of the action-type(s) is useful. Because there is a finite set of activities called for by guideline recommendations, categorization can facilitate a pattern of beneficial services associated with that action.

Effective implementation planning is key to adoption and adherence. Stand-alone guideline implementation projects do not work well, but should be part of a broader and well-supported quality-improvement effort, potentially integrated with maintenance of certification or the Centers for Medicare and Medicaid Service’s meaningful use requirements. When planning for adoption, implementers should also consider incentives, feedback loops, site-based guideline “champions”, and integration of performance measurements. Implementers should also include evaluation of adherence and outcomes in CDS design up-front, since ensuring access to appropriate and granular data for outcomes reporting is a key challenge.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve healthcare decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Patient-Centered Medical Home Information Model

Principal Investigator: Waldren, Steven, M.D., M.S., A.A.F.P.
Organization: Westat
Contract Number: 290-09-000231-6
Project Period: August 2010 – August 2011
AHRQ Funding Amount: $286,513
Summary Status as of: December 2010

Target Population: General

Summary: Primary care professional organizations, the National Center for Quality Assurance, and other entities establishing medical home programs have developed working definitions of the “patient-centered medical home” (PCMH). These definitions are based on many factors, including high-level joint principles, structural characteristics of medical practices, and adoption of particular technologies. However, a better framework for the definition of PCMH in functional terms is needed to help move the field forward. This could be accomplished by providing consumers, providers, and policymakers with first-person narrative descriptions of the interactions assumed in the medical home model, and by establishing a framework for building the information and communication infrastructure needed to scale the medical home concept operationally.

Westat is working with the American Academy of Family Physicians to develop a functional model to define the PCMH that would describe it in both narrative and technical terms through the interactions between and among PCMH stakeholders. The interactions to be described include those between and among: patients and consumers; providers; other members of the health care team; practice-specific or shared resources; specialists; hospitals; and community and national entities such as support organizations, purchasers, payers, and patient advocacy groups.

A comprehensive literature review will map patient interactions within the PCMH model. An expert panel representing various stakeholders will be convened to review the initial draft of the information model and provide input for its further development. Small working and focus groups consisting of patients, medical office staff, and providers will also be convened to further validate the model and ensure that it will be successful in a busy primary care practice. Finally, feedback from these groups will be consolidated to develop non-technical narrative and technical reports to describe the PCMH information model.

Project Objectives:

- Conduct a comprehensive literature review into the various interactions a patient has within a patient-centered medical home. (Achieved)
- Convene an expert panel to obtain key stakeholder input on development of the PCMH information model. (Ongoing)
- Convene working groups and focus groups for the purpose of model validation. (Upcoming)
- Develop non-technical narrative and technical reports to describe the PCMH information model. (Upcoming)
**2010 Activities:** The primary focus of activities has been on conducting the literature review, which preceded the development of the PCMH information model. The literature review is complete and will describe the various interactions that a patient has within the medical home. The preliminary development of the information model is underway. The expert panel has been identified and consists of 15 participants who represent various stakeholders, including patient advocates and providers. The group is working to schedule their first meeting, during which they will review the initial draft of the PCMH information model.

**Preliminary Impact and Findings:** There are no findings to report at this time.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
Quality Oral Health Care Through Health Information Technology

**Principal Investigator:** Austein-Casnoff, Cheryl  
**Organization:** NORC  
**Contract Number:** 290-07-10039T-1  
**Project Period:** June 2010 – June 2011  
**AHRQ Funding Amount:** $89,861  
**Summary Status as of:** December 2010

**Target Population:** Medicaid, Pediatric*  

**Summary:** Disparities in access to quality dental care between privately and publicly insured beneficiaries are a well documented and longstanding concern for children in public programs and dentists who could provide their care. The lack of essential dental care results in consequential functional impairments and lost educational opportunities for children. For dentists, the failure to engage in public insurance programs represents lost opportunities to serve a large population that has significant need. It is estimated that fewer than seven percent of primary care dentists’ patients are Medicaid, compared to 28.5 percent of pediatric physicians’ patients. Far fewer dentists than pediatricians participate in Medicaid, with roughly 20 percent of dentists and 89.5 percent of pediatricians participating.

New federal incentives created by the American Recovery and Reinvestment Act of 2009 and its Health Information Technology for Economic and Clinical Health Act provisions are designed to engage health care providers in developing and implementing health information technology (IT) and health information exchange in ways that can improve access and quality of essential health services. These tools promise to expand and improve care, enhance reporting and accountability, engage patients in their own wellness, create virtual networks of providers, expand dentists’ linkages to primary health care, and in the use of clinical guidelines and protocols.

While data are limited, it appears that dentistry lags behind medicine in adopting health IT and benefiting from the implementation and meaningful use of health IT systems. One key barrier is the absence of certified dental IT software that meets meaningful use criteria. As a result, vendors should accelerate efforts to create electronic health record and electronic dental record applications for dentists to meet these requirements.

Now that providers must meet a minimum Medicaid patient volume threshold of 30 percent in order to qualify for Medicaid meaningful use incentive payments, dentists may be encouraged to provide dental care to Medicaid insured children who receive inadequate oral health care.

This project is helping to identify the impact of meaningful use incentive payments on dentists serving Medicaid-eligible children and how these payments might expand access to quality oral health care for children enrolled in Medicaid and/or the Children’s Health Insurance Program (CHIP). This project offers a valuable opportunity to bring together individuals in various disciplines to offer recommendations for ways in which health IT, payment incentives, Medicaid, and the children’s oral health fields can work together to better provide access to oral health care for low-income children.
Project Objectives:

- Develop a Background Report on Health IT and Dentistry for the Expert Panel Meeting. (Achieved)
- Invite participants and convene an Expert Panel Meeting. (Achieved)
- Produce a final report and PowerPoint presentation. (Upcoming)

2010 Activities: The team completed an extensive literature review and produced the Background Report for the Expert Panel Meeting. Panel members were identified and invited to a meeting to be held in 2011 and the team coordinated logistical tasks to successfully convene the meeting.

Preliminary Impact and Findings: The Background Paper is meant to form the foundation for discussion at an Expert Panel Meeting on ways that health IT might be developed for dentistry and improve access to quality oral health care for Medicaid and CHIP enrollees. The literature review and discussions with various stakeholders in preparation of this paper allowed the team to determine the following gaps and issues to be addressed by the expert panel:

- Might the Meaningful Use Incentive payments serve as an incentive for providers to serve Medicaid and CHIP children?
- Might the functionalities of health IT increase access to oral health care for Medicaid and CHIP enrollees by making this population more attractive to dentists?
- Might the functionalities of health IT increase access to oral health care for Medicaid and CHIP enrollees by helping this population find oral health providers and understand the importance of quality oral health care?

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination

* AHRQ Priority Population
Building an Implementation Toolset for E-Prescribing

Principal Investigator: Bell, Douglas, M.D.
Organization: RAND Corporation
Contract Number: 290-06-0017-4
Project Period: August 2008 – September 2011, Including No-Cost Extension
AHRQ Funding Amount: $999,825
Summary Status as of: December 2010

Target Population: General

Summary: This project is developing and testing complementary toolsets for implementing e-prescribing across various ambulatory care settings and pharmacies. The toolsets, one for health care providers and one for pharmacies, provide comprehensive guidance on activities that contribute to successful implementation, addressing technology requirements, workflow analysis tools, and governance agreement templates. The project includes: 1) an environmental scan of current national and international e-prescribing implementation programs; 2) detailed analysis of successful e-prescribing implementations in several organizational configurations, including large and small practices and safety net settings; 3) development of an implementation toolset based on these findings; and 4) pilot testing of toolsets. The toolsets will be evaluated on usability and usefulness for implementing e-prescribing in a broad range of practices. The goal is to develop toolsets to guide community and organizational decisionmaking about and implementation of e-prescribing.

To inform toolset development, several e-prescribing initiatives were analyzed to assess the contribution of key practices and features to successful implementation. The research team examined governance agreements, organizational characteristics, individual attitudes and motivations, prescription-related work processes, use of specific e-prescribing technologies and standards, distinctive implementation practices, and estimated costs (versus savings) for each participating organization. The findings from the analysis provide guidance and customizable aids to help organizations adopt practices and characteristics that contribute to successful implementation. The guidance includes goal-setting, timelines, workflow patterns, feasible work process transitions, and direction on other key organizational factors including leadership, organizational culture, employee involvement, training, performance evaluation, and incentives.

Project Objectives:

• Catalogue publicly-announced, ongoing e-prescribing initiatives. (Achieved)
• Assess contributors to successful implementation of e-prescribing initiatives. (Achieved)
• Create two draft e-prescribing implementation toolsets. (Achieved)
• Evaluate the draft toolset’s usability and usefulness in helping provider organizations implement e-prescribing. (Ongoing)
• Create a final e-prescribing implementation toolset based on findings from the pilot evaluation. (Ongoing)
2010 Activities: Pilot testing of the toolsets began among prescribers and pharmacies that are adopting e-prescription functionality. Field researchers visited each practice before and after the e-prescribing draft toolsets are piloted to conduct semi-structured interviews and observations of work processes. The research team has modified the toolkits based on pilot testing and is working to create a final product that organizations and communities can use when considering e-prescribing. The toolsets will be evaluated in 2011 on usability and usefulness in helping implement e-prescribing in a broad range of practices.

The toolsets will be publicly available in late summer 2011. The project team is making draft versions of the toolsets available for extended pilot testing to Regional Extension Centers through the Health Information Technology Resource Center’s Communities of Practice.

Preliminary Impact and Findings: Findings will be made available upon completion of the project’s final report.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Implementation and Use
Applying Lessons Learned in Community Collaboration to Health Information Technology

Principal Investigator: Berkowitz, Alicia  
Organization: IMPAQ International, LLC  
Contract Number: 290-07-10071-5  
Project Period: January 2010 – August 2011  
AHRQ Funding Amount: $298,905  
Summary Status as of: December 2010

Target Population: Not Applicable

Summary: Establishing systems for electronic data exchange presents technical and financial challenges and challenges stakeholder collaboration. Approaches that create mutual benefits, meet competing needs, and generate operating efficiencies need to be identified. This project focuses on how models of community planning and development in health care and other industries can be used to establish sustainable Regional Health Information Organizations (RHIOs) and health information exchanges (HIEs). It seeks to identify characteristics that distinguish successful and unsuccessful collaborations to guide future RHIO and HIE development.

The project team convened a meeting of stakeholders to obtain input on best practices for collaboration. In preparation for the meeting, the project team developed a background report that includes a literature review and dissemination plan. Based on the literature review and meeting outcomes, the team will draft a summary of best practices and recommendations for establishing and sustaining RHIOs and HIEs. The team will prepare a final report that will include models and case studies to describe applicable best practices from the field of community development, and will make recommendations for ongoing research, implementation, and policy work.

Project Objectives:

• Conduct a comprehensive literature review on community planning and development as well as RHIO and HIE initiatives. (Achieved)

• Convene an innovation meeting comprised of RHIO and HIE leaders and national and international community planning experts to assess the applicability of community collaboration models to sustainable RHIOs and HIE, and to identify best practices, illustrative models, and case studies. (Achieved)

• Prepare a final report synthesizing results and findings from the literature review and meeting and make recommendations for ongoing research, implementation, and policy work in the RHIO and HIE fields. (Ongoing)

• Develop, execute, and evaluate a communication and dissemination plan to drive awareness and integration of project findings and recommendations into practice at national, State, and local levels. (Ongoing)

2010 Activities: Project staff conducted the literature review, finalized the project work plans, and held an innovation meeting. An innovation meeting transcript and summary were provided to the Agency for
Healthcare Research and Quality (AHRQ). Findings from the literature review and innovation meeting discussions were synthesized into a Draft Final Report. In addition the team developed an Updated Dissemination Plan. Both documents were submitted to AHRQ. Upon receiving AHRQ’s feedback on the drafts, a Final Report will be prepared and sent to AHRQ; execution of the dissemination plan will then commence.

**Preliminary Impact and Findings:** The project has no reportable findings at this time.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination
Learnings for Implementing Electronic Exchange of Health Information: A Synthesis of AHRQ’s Health Information Exchange Projects

Principal Investigator: Bhardwaj, Ajay, Ph.D.
Organization: AFYA, Inc
Contract Number: 290-07-10034-2
Project Period: June 2009 – June 2010
AHRQ Funding Amount: $294,757
Summary Status as of: June 2010, Completion of Contract

Target Population: General

Summary: Over the past few years, extensive peer-reviewed and grey literature has indicated that implementing health information exchange (HIE) requires special organization-specific considerations and may pose challenges similar to those associated with the implementation of electronic health records. This project focuses on understanding key lessons learned by the six Agency for Healthcare Research and Quality (AHRQ)-funded State and Regional Demonstrations in Health Information Technology (SRDs) and creating a catalog of resources for HIE stakeholders.

These States and their respective health information organizations (HIOs) are:
• Colorado: Colorado Regional Health Information Organization (CORHIO)
• Delaware: Delaware Health Information Network (DHIN)
• Indiana: Indiana Network for Patient Care (INPC)
• Rhode Island: currentcare
• Tennessee: Mid-South e-Health Alliance (MSeHA), project management team from Vanderbilt University Center for Better Health
• Utah: Utah Health Information Network (UHIN)

The AFYA project team collaborated with the SRD projects to synthesize information on the challenges and success factors for developing sustainable community, statewide, or regional exchange of health information. A comprehensive literature review and environmental scan was done among peer-reviewed publications, evaluation reports, industry publications, and HIE support tools. The project yielded a synthesis report, which presents narrative profiles for each of the SRDs and a summary of experiences and lessons learned. In addition, the research team compiled sample documents from the project teams to include in the AHRQ National Resource Center on Health Information Technology resource repository.

Project Objectives:
• Conduct a comprehensive literature review and environmental scan of projects, progress, lessons learned, and available resources in the HIE field. (Achieved)
• Develop and implement a scientifically rigorous approach to working collaboratively with AHRQ SRDs in health information technology. (Achieved)
• Develop a detailed HIE synthesis report with recommendations for the adoption of processes that will promote HIE. **(Achieved)**

• Identify sample documents for the AHRQ National Resource Center resource repository to help accelerate HIE in other communities. **(Achieved)**

**2010 Activities:** Activities focused on collecting HIE tools and resources and completing the SRD case studies. Steps toward completing these studies included: 1) collection and analysis of the content of documents with relevant data, such as project meeting notes and progress reports to AHRQ; 2) conducting preliminary phone interviews to confirm data extracted from documents and discuss processes and lessons learned during project implementation; 3) synthesis and summarization of documents and interview data to identify gaps and draft an initial narrative description; and 4) followup phone interviews to discuss details of decision rationales, mechanisms of implementation, and lessons learned.

**Impact and Findings:** The SRD projects each took critical steps towards implementation and system development in order to create stable HIOs and establish HIE. The multi-year terms of the SRD projects provided HIOs with the time necessary to gain an understanding of community and business stakeholders’ perspectives and to develop policy and technical systems to meet their needs. Lessons learned focused on the importance of project management skills, strategic planning, stakeholder engagement, business development, and ensuring responsiveness to community needs and concerns. Engaging community stakeholders, developing effective management plans, and planning for long-term sustainability presented the main challenges. All HIOs agreed that technical development was the least challenging aspect of implementation and operations.

The following are key lessons that HIOs learned:

• **Project Planning and Management:** All HIOs determined that setting goals and defining the operational steps of achieving those goals was critical for success.

• **Building Community Trust:** HIOs agreed that building community trust is accomplished through stakeholder engagement and addressing concerns about privacy.

• **Project Implementation:** Since policy and technical operations are mutually informative, HIE organizations should develop both simultaneously. HIOs agreed that it is essential for a leader with decision making authority to define a concrete plan for progress and completion.

• **Technical Considerations:** The HIOs provided valuable information by testing different technical solutions. Areas for which continued work is needed include electronic Master Patient Index development and patient matching algorithms. New elements of the exchange must be technically tested and must meet business value criteria before they can be effectively implemented. Some HIOs developed specific methodologies for technical testing and business assessment that they applied to new capabilities and data types.

• **Demonstrating Value:** HIOs reported that they demonstrate value most effectively when they present how the exchange decreases expenses of participating organizations and simplifies information exchange procedures. HIOs must discuss the value of participation in an exchange in a way that goes beyond simple monetary discussions. Saving money is an integral part of the value proposition but a more comprehensive appeal for participation is necessary to promote participation in a regional or State exchange.

• **Sustainability:** Long-term sustainability requires a nuanced understanding of stakeholders’ perspectives and priorities and the ability to present individualized value propositions based on this
understanding. In addition, while HIEs may offer large return on investment across stakeholders, the savings may be diffuse. HIOs must develop value propositions that take this into account. Markets and technologies for HIE evolve rapidly and vary across different regions. HIOs must focus on developing core ideas that can remain relevant in response to changes and variations.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination
**Industrial & Systems Engineering and Health Care: Critical Areas of Research Workshop**

**Principal Investigator:** Brennan, Patricia Flatley, R.N., Ph.D.

**Organization:** Professional and Scientific Associates

**Contract Number:** 290-09-00027U

**Project Period:** June 2009 – November 2010

**AHRQ Funding Amount:** $186,140

**Summary Status as of:** November 2010, Conclusion of Contract

**Target Population:** Not Applicable

**Summary:** Since the 1970s, the concept of better integrating engineering principles and practices into health care system design has held great allure and promise. Although there have been instances of successful collaboration, it has been challenging to bridge the conceptual and practical divides between disciplines. A 2005 report from the Institute of Medicine and the National Academy of Engineering titled, *Building a Better Delivery System: A New Engineering/Health Care Partnership*, outlined broad research activities needed to improve health care delivery.

The Health Information Technology (IT) Portfolio at the Agency for Healthcare Research and Quality (AHRQ) and the Service Enterprise Systems (SES) Program at the National Science Foundation (NSF) seek to strengthen partnerships between the health services community and the industrial and systems engineering community to achieve the portfolio and program goals set for AHRQ and SES. Therefore, AHRQ and NSF co-funded a workshop to identify potential projects or topics of mutual benefit, and to define a research agenda for how industrial and systems engineering may support health services research and health care delivery redesign, with a focus on health IT.

The primary purpose of the developed research agenda was to provide guidance related to the type of research that should be prioritized at the intersection of Industrial Systems and Engineering (ISyE) and health care to realize the vision of an ideal health care delivery system. Completion of this research agenda should lead to: 1) improvement in the health of society by improving health care sector performance; 2) the creation of new ISyE knowledge that may be used to improve the health care industry, but also other manufacturing and service industries; and 3) a clearer understanding of the health IT resources required to achieve the vision of an ideal health care delivery system. This research agenda should be completed in the next five to seven years, in order to yield change in the next 10 to 15 years.

**Project Objectives:**

- Develop and publish a background report that summarizes and critiques past meetings and documents to guide the current effort. *(Achieved)*
- Host a workshop of national experts. *(Achieved)*
- Develop and publish a research agenda including a prioritized list of critical areas of research. *(Achieved)*
- Disseminate the research agenda. *(Achieved)*
2010 Activities: The project team primarily focused on concluding project activities by developing the final report titled, Industrial and Systems Engineering and Health Care: Critical Areas of Research--Final Report, which includes the research agenda, and disseminating the report to relevant audiences. The final report synthesizes and discusses the outcomes of the workshop within the context of the knowledge gleaned from the background materials. The report emphasizes that the project objectives call for a system-wide breakthrough change, and proposes a research agenda as well as an action agenda. The report was disseminated at the annual national conferences for the following organizations: the Institute of Industrial Engineers (IIE), AcademyHealth, the Human Factors and Ergonomics Society (HFES), the Institute for Operations Research and the Management Sciences (INFORMS), and the American Medical Informatics Association (AMIA).

Impact and Findings: As discussed by workshop participants and described in the report, an ideal health care system must be one that is new, patient-centered, and engineered as well as relies on research to accomplish three goals:

1. Stimulate innovation in ISyE methods better aligned with the complex, distributed, and stochastic nature of health care (Knowledge Innovation);
2. Accelerate knowledge transfer of ISyE methods to solve currently recognized health care challenges (Knowledge Transfer); and
3. Integrate overarching meta-knowledge lessons gleaned from purposefully targeted research projects (Meta-Knowledge Integration).

Investment in these three research themes will result in three types of benefits: sustainability improvements to the known health care delivery system; breakthrough, radical change leading to the vision of the new health care delivery system; and capacity building that expands the breadth and depth of ISyE knowledge relevant to health care.

Action items in five domains were identified to push the research agenda forward. These domains include:

• Collaboration. 1) Creating consortia of all stakeholders including government, providers, payers, consumers, the insurance industry, and vendors; 2) Promoting multi-stakeholder conversations through interdisciplinary projects; 3) Fostering partnerships among and between agencies, organizations, associations, academia, and industry; and 4) Identifying or forming a professional home at the intersection of ISyE and health care.

• Education and Training. 1) Creating and enhancing interdisciplinary higher education programs; 2) Expanding professional development and cross-training; 3) Initiating early and mid-career fellowships in health care for ISyE professionals; and 4) Compiling a library of case studies.

• Funding. 1) Investing in high potential research focusing on the knowledge innovation directions presented in the research agenda; 2) Supporting community-based, low technology, low cost research; 3) Providing capacity building start-up funding for organizations; 4) Creating centers of excellence; and 5) Requiring multidisciplinary grant teams.

• Dissemination. 1) Facilitating publication; 2) Fostering networking; and 3) Launching and supporting demonstration projects within real health care organizations.

• Administration. 1) Developing joint solicitations and collaborative funding to drive the research agenda proposed in this report; and 2) Accelerating the proposal cycle for grants relevant to the research agenda in the report.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Synthesis and Dissemination
Quality Indicators Care Coordination Measures Project

**Principal Investigator:** Brustrom, Jennifer, Ph.D.

**Organization:** Battelle Memorial Institute

**Contract Number:** 290-04-0020

**Project Period:** September 2009 – September 2011

**AHRQ Funding Amount:** $400,000

**Summary Status as of:** December 2010

**Target Population:** Not Applicable

**Summary:** Care coordination is the deliberate organization of patient care activities between two or more participants (including the patient) involved in a patient’s care to facilitate the appropriate delivery of health care services. Organizing care involves marshalling personnel and other resources to carry out all required patient care activities, and is often managed by the exchange of information among participants responsible for different aspects of care.

The health care community is struggling to determine how to measure when and if this vital activity is occurring. The National Quality Forum recently concluded that adequate measures of care coordination do not exist and are urgently needed. Especially pressing is the need to evaluate the effectiveness of care coordination within the primary care, patient-centered medical home.

Initial investigation into current care coordination measurement approaches will be based on: multiple data sources (electronic health record systems, consumer surveys, and administrative claims databases); information on national organizations’ care coordination measurement activities; review of applicable Agency for Healthcare Research and Quality (AHRQ) publications; a comprehensive search of peer-reviewed literature; and input from expert and stakeholder panels. The project will include insights on patient and caregiver experiences with care coordination, as well as clinician and researcher perspectives. In addition, the project will identify potential data sources for assessing care coordination that simultaneously support patient care and measurement objectives. Ideally, routinely monitored care coordination measures should not increase the burden of providing high-quality patient care, but should support better management of patients. By the end of the project a care coordination measurement summary report, measurement plan, and evaluative tool will be developed.

**Project Objectives:**

- Identify and assess ambulatory care coordination measures and develop an initial list of candidates for evaluation by the AHRQ Quality Indicator development process, with a particular focus on measuring ways that care coordination might prevent emergency room visits and unnecessary hospital readmissions. *(Achieved)*

- Develop a tool to assess care coordination interventions in studies and demonstration projects in the short term while measurement development activity proceeds. *(Achieved)*

**2010 Activities:** The Care Coordination Measures Atlas (the tool) was completed during this period. The Atlas provides background information on care coordination, a framework for care coordination measurement, and system for users to identify measures of care coordination that may meet their evaluation needs.
A number of activities were accomplished which facilitated the development of the Atlas. First, the study team identified existing measures of care coordination. Four key sources were reviewed to identify potential measures of care coordination: 1) published literature; 2) the 2007 Evidence-based Practice Centers (EPC) systematic evidence review on care coordination; 3) suggestions by participants in the convened expert and stakeholder panels; and 4) the draft National Quality Forum report on care coordination measurement. The team also performed additional Internet searches and identified additional measures through this source. The 2007 EPC systematic evidence review included a review of systematic reviews of care coordination interventions. The team updated that review using the same search strategy, inclusion, and exclusion criteria for studies published between September 2006 and September 2009. They assessed the quality, abstracted results, and synthesized the evidence for each component of the 31 reviews.

In addition, the study team contacted over 20 individuals involved in the field of care coordination and invited them to participate as members of either the expert panel or the stakeholder panel. Individual 1 hour calls with each panelist were held in addition to group discussions via conference call. The expert panel provided feedback and guidance on the development of Atlas. The stakeholder panel informed the team about current and ongoing care coordination measure development activities. A third panel, the user panel, was created in August 2010 by contacting individuals from the Quality of Cancer Care Committee. The user panel provided evaluative feedback on the Atlas from a user perspective.

The study team also developed a technical report which assessed the landscape of existing care coordination measures and the availability of data sources for measuring care coordination. To accomplish the data sources assessment, the team used a two-pronged approach. First, they reviewed the identified data sources used or proposed by all of the unique, relevant, quantitative, and clearly defined care coordination measures. Particular attention was given to those that rely on an existing data source such as review of medical records, administrative claims data, or large surveys conducted on an ongoing basis. Second, they evaluated additional data sources, including health information technology systems, to assess their potential for measuring care coordination.

**Impact and Findings:** Through the completion of study activities, staff developed the **Care Coordination Measures Atlas**, which is now publicly available through the AHRQ Web site. The Atlas catalogues 61 measures of care coordination, maps them to elements of a care coordination measurement framework, and summarizes key measure properties. The Atlas also includes background information to help orient users towards the field of care coordination, including key definitions, a framework of care coordination activities, broad approaches hypothesized to improve care coordination, and a measure selection guide to assist Atlas users in narrowing the field of available measures to those likely to be most relevant. The Atlas is geared towards three main audiences: 1) evaluators of interventions or demonstration projects that aim to improve care coordination (either as a primary or secondary goal); 2) anyone wishing to evaluate the practice of care coordination or its effects outside the context of interventions or demonstration projects, including quality improvement practitioners; and 3) researchers studying care coordination.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination
Incorporating Health Information Technology into Workflow Redesign

**Principal Investigator:** Carayon, Pascale, Ph.D., and Karsh, Ben-Tzion, Ph.D.

**Organization:** University of Wisconsin

**Contract Number:** 290-08-10036

**Project Period:** January 2009 – December 2010

**AHRQ Funding Amount:** $494,028

**Summary Status as of:** December 2010, Conclusion of Contract

**Target Population:** Not Applicable

**Summary:** Health information technology (IT) systems provide computerized clinical information to clinicians and/or patients and are seen as beneficial to health care quality and patient safety. However, evaluations of the impact of health IT on quality and safety show mixed results. The main reason for unfavorable results seems to be related to difficulty integrating health IT into clinical workflows across organizations (e.g., between a clinic and community pharmacy), within a clinic, during a visit, or into the cognitive work of the clinician. It is clear that health IT must be designed to fit specific contexts if it is to work.

The University of Wisconsin’s Center for Quality and Productivity Improvement developed a toolkit that small- and medium-sized ambulatory practices can use to assess workflow and determine how health IT may be implemented and used in this context. The work was conducted by a multidisciplinary team of researchers in human factors and ergonomics, industrial and systems engineering, sociology, psychology, health informatics, and medicine.

**Project Objectives:**

- Assess existing research and evidence on the impact of health IT on workflow in outpatient settings and how health IT can be used to assess workflow in these settings. *(Achieved)*
- Identify resources for workflow assessment in health care as well as proven workflow analysis methods and instruments used in the fields of human factors and ergonomics that could be applied in health care settings. *(Achieved)*
- Synthesize information in a toolkit. *(Achieved)*

**2010 Activities:** In 2010, the team synthesized the information submitted to the request for information (RFI) in a report and summarized the information identified in the literature review and environmental scan in a final report. The information submitted in response to the RFI and the information identified in the literature review and environmental scan were synthesized into a Web-based toolkit. This toolkit explains the importance of analyzing workflow when implementing and using health IT applications and summarizes commonly used methods for workflow assessment, explaining the purpose, advantages, disadvantages, how to use it, and where to get more information for each method. It also includes stories drawn from the literature that describe the health IT implementation experiences of small- and medium-sized ambulatory practices. From the comprehensive list of workflow analysis methods included in the toolkit, the project team selected a small group of basic tools that they consider to be most helpful to the
end users. These include checklists, flowcharts, interviews, observations, risk assessment, benchmarking, and usability.


**Impact and Findings:** From the literature review and environmental scan, the research team found that although awareness has been increasing about the value of workflow analysis to ensure successful health IT implementation, evidence about the relationship between health IT and workflow is lacking. Relatively few published articles focus on the topic of clinical workflow change related to health IT implementation. There is also a lack of standard definitions of workflow and types of health IT, making comparisons and generalizations difficult. Despite the limitations of the research, a great deal of information was uncovered about how health IT can impact workflow in small- and medium-sized ambulatory practices and how health IT can be used to study workflow in these practices. The team categorized workflow by: 1) patient workflow; 2) clinic provider or staff workflow; 3) workflow between organizations; and 4) workflow taking place during or between clinic encounters.

Findings from the literature review show that implementing an electronic health record or electronic medical record changes the interaction and communication between providers and patients, the work time and workload of physicians and clinic staff, access to information, legibility of records, ease of data extraction, and documentation. Among decision support system implementations, effects were found on guideline adherence, length of consultations, communication between provider and patient, providers’ time, team coordination, and access to information. The implementation of electronic prescribing systems also affected the efficiency of processes and processing time. Telemedicine implementations were described as having an impact on the time of providers and patients, collaboration, coordination, communication, role flexibility, and workload. For each type of health IT application, there were also changes related to acceptance and usability.

The environmental scan also uncovered concerns among providers about how workflow would change with health IT implementation. Specifically, providers were worried about being required to change the way they practiced medicine, how they interacted with patients, the time they would have to spend in front of a computer, and the general flow of their work. It is assumed that when a health IT system is implemented, changes—positive and negative—result. However, it is important to consider that the impact of any health IT implementation can be confounded by additional variables, including but not limited to, system functionality and usability, training, technical support, and the timeline of the implementation.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
Reducing Disparities in Health Care Quality for Priority Populations: An Approach Focused on Improving Care in Under-Resourced Settings Using Health Information Technology and Other Quality Improvement Strategies

**Principal Investigator:** Casale, Cecilia, Ph.D.

**Organization:** Professional and Scientific Associates and Medical Care Research and Review

**Contract Number:** 290-09-10014

**Project Period:** March 2009 – December 2010

**AHRQ Funding Amount:** $160,748

**Summary Status as of:** December 2010, Conclusion of Contract

**Target Population:** Asthma, Diabetes, Elderly*, Low SES/Low Income*, Pediatric, Racial/Ethnic Minorities*, Women*

**Summary:** The Agency for Healthcare Research and Quality (AHRQ) seeks to build a research and action agenda for reducing disparities in health care quality among the AHRQ priority populations. AHRQ convened a meeting that provided recommendations to advance this effort. Five papers were commissioned. An introductory paper focused on how under-resourced settings (URS) could overcome health information technology (IT) implementation challenges and provided insight on how health IT might improve care and reduce disparities. The remaining four papers were case studies of large and persistent disparities in quality of care, as identified by the United States Department of Health and Human Services and AHRQ’s National Healthcare Disparities and Quality Reports. The papers will be published in a journal supplement with an introduction authored by AHRQ staff.

The case studies addressed the reduction of differences between: 1) Black and White children in asthma hospitalization rates; 2) Black, Hispanic, and White diabetic adults in lower-extremity amputation hospitalizations; 3) Black, Hispanic, and White women in receiving early prenatal care; and 4) low-income and higher-income Asian and White children and adults in receiving good provider-patient or family communication. The case studies combined literature reviews and creative thinking to produce recommendations for a research and action agenda to use health IT and other strategies to reduce disparities in quality of care.

**Project Objective:**

- Build a research and action agenda for reducing disparities in health care quality among priority populations. **(Achieved)**

**2010 Activities:** The project team made arrangements for all meeting logistics including location, audiovisual equipment, food and beverage services, hotel and travel for participants, and securing a facilitator and speakers. The team conducted conference calls to develop the workshop agenda, topics, and the participant list. They also arranged for development of workshop materials including registration and conference materials, agenda, participant list, a workshop Web site, an audiotape of the entire workshop, and a written summary of the workshop proceedings. A final report was prepared and is posted on the AHRQ Web site.
Impact and Findings: Meeting participants identified the following specific research needs:

• Increasing patient empowerment using health IT.
• Using tools that are already in place.
• More testing of electronic medical records in URS serving priority populations.
• Examining technology development and policy.
• Understanding what is needed for maintenance once the IT is in place.
• Applying the business case.
• Exploring the role of disease registries.

Meeting participants suggested the following as possible directions for AHRQ to pursue:

• Focus funding opportunities on small, low-reimbursement practices, and other URS.
• Consider whether the funding process can be accelerated so changes in health IT can converge with research efforts.
• Study how to facilitate partnerships among URS, researchers and evaluators, and health IT experts.
• Provide guidance on study designs that are both rigorous and relevant.
• Create a task force to continue work on disparities, under-resourced settings, health IT, and quality improvement.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination

* AHRQ Priority Population
Technical Assistance for Health Information Technology and Health Information Exchange in Medicaid and the Children’s Health Insurance Program

Principal Investigator: Dimitropoulos, Linda, Ph.D.
Organization: RTI International
Contract Number: 290-07-10079T
Project Period: September 2007 – February 2011
AHRQ Funding Amount: $2,990,592
Summary Status as of: December 2010

Target Population: Low Income/Low SES,* Medicaid, Pediatric*

Summary: As the largest purchasers of health care for low-income and vulnerable populations in the United States, Medicaid and the State Children’s Health Insurance Program (CHIP) are well-positioned to support the adoption and implementation of health information technology (IT) and health information exchange (HIE) to improve services for their clients. Medicaid and CHIP agencies have been working toward increased involvement in the planning and implementation of health IT systems. The goal of this project is to improve the coordination and quality of care by providing technical assistance (TA) to agency personnel to plan and implement health IT and HIE.

RTI International (RTI) is in the process of developing and implementing a 3-year TA program for Medicaid and CHIP agencies based on multiple sources of information including a needs assessment, a multistate collaborative, and ongoing communication and interaction among the participants. The information project staff collected includes: current and planned health IT and HIE projects and implementation plans of the Medicaid and CHIP agencies; TA needed to accomplish the agency health IT and HIE plans and projects; cost and value data to develop the business case for technology adoption; program evaluation planning; barriers or challenges to current or planned health IT and HIE plans; and preferences for how TA should be provided (Webinar, workshop, etc.).

RTI developed and maintains a repository of health IT- and HIE-related information that is specific to Medicaid and CHIP. RTI also developed and maintains a Medicaid and CHIP-specific section of the Agency for Healthcare Research and Quality (AHRQ) National Resource Center (NRC) Web site. It systematically reviews and synthesizes the literature on costs and value of established health IT and HIE to Medicaid and CHIP programs and supports a set of ongoing health IT and HIE Communities of Practice for Medicaid and CHIP agency staff. RTI also set up a hotline with a toll-free number that personnel at agencies can call to speak to a member of the RTI team with questions regarding the project.

Project Objectives:

- Complete a nationwide assessment of Medicaid and CHIP health IT and HIE plans. (Achieved)
- Develop a 3-year TA plan based upon findings of nationwide assessment. (Ongoing)
- Establish a menu of additional tools and strategies to support Medicaid and CHIP health IT and HIE development. (Ongoing)
**2010 Activities:** RTI continued to work with Federal- and State-level partners to monitor the factors that affect the health IT and HIE needs of Medicaid and CHIP. Project staff continued to update information about Medicaid and CHIP agencies’ initiatives, their plans to respond to American Recovery and Reinvestment Act (ARRA) regulations through 2010, and their needs for TA. TA plans for 2010 and 2011 were updated accordingly.

Project staff continued to develop and deliver a comprehensive series of free Webinars, Web-based workshops, and in-person workshops on a wide range of health IT and HIE topics featuring national experts and leaders. Topics were identified and selected based on information gathered from the nationwide Medicaid and CHIP needs assessment, ongoing monitoring, and input received from the project technical expert panel.

A report on Medicaid participation in HIE was drafted and is under final review by AHRQ. The report discusses Medicaid participation in HIE prior to the passage of ARRA and the Health Information Technology for Economic and Clinical Health (HITECH) Act, the reported challenges to HIE participation, and how ARRA and HITECH will address those challenges. The report also discusses policy changes, such as the Affordable Care Act, that will impact Medicaid agencies’ ability to participate in HIE.

Project staff maintained two existing communities of practices (CoPs) for the full year and a third CoP for part of the year. Staff also established two new CoPs in 2010. These serve as open, collegial platforms for staff to access and exchange up-to-date information on health IT issues that are most relevant to Medicaid and CHIP agency staff. Based on an in-person CoP meeting, staff developed and delivered a report titled, “Applying Health Information Technology in Medicaid and CHIP to Measure and Improve Children’s Health Care Quality”.

A series of State-specific case studies was developed and posted on the NRC Web portal. These case studies describe best practices and lessons learned regarding health IT adoption and HIE participation as reported by Medicaid agencies and from one-on-one interviews with agency staff.

The section of the NRC Web site that RTI developed and maintains contains static information about the project, a calendar of all scheduled upcoming TA sessions, links to 508-compliant materials from all Webinars and Web-based workshops provided since the outset of the project, and links to all publicly-released reports created under the project.

**Preliminary Impact and Findings:** The Year 1 needs assessment analysis revealed the following: 1) most agencies had at least one health IT initiative and more than half had at least two; 2) many States and territories had plans to evaluate the value of their health IT initiatives but few could provide any details; 3) the main challenges for agencies were costs, infrastructure and other resources, provider adoption, sustainability, and system technicalities; 4) best practices and lessons learned involved planning and budgeting, increasing communication and coordination, early and frequent stakeholder engagement, and acquiring appropriate staff and expertise; 5) the primary challenges to HIE initiatives were infrastructure and resource issues; 6) quality improvement and increased communication and interoperability were reported most frequently as the primary goals and objectives of the HIE initiatives; and 7) half of the reporting agencies had limited or no plans to evaluate the HIE efforts. A discussion in September 2010 with technical expert panel members from the Centers for Medicare and Medicaid Services and the Office of the National Coordinator for Health IT concluded that the TA and other support services provided by this program filled an important gap in their respective programs, engaging an important group of stakeholders that were not otherwise targeted.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination

* AHRQ Priority Population
Implementing and Improving the Integration of Decision Support into Outpatient Clinical Workflow

Principal Investigator: Doebbeling, Bradley, M.D., M.Sc.
Organization: Indiana University
Contract Number: 290-06-0013-3
Project Period: September 2007 – March 2011, Including No-Cost Extension
AHRQ Funding Amount: $394,622
Summary Status as of: December 2010

Target Population: Adults, Cancer

Summary: Computerized clinical decision support (CDS) and the use of electronic medical records (EMRs) can improve clinical decisions, adherence with evidence-based guidelines, and quality of care. However, the implementation of CDS into clinical settings is not well understood and poor integration can hinder its use and minimize its benefits. Common barriers to implementation include poor interface design, usability problems, and failure to accommodate the workflow of a clinical environment.

This project is a field study and controlled simulation analysis on integrating CDS for colorectal cancer screening into outpatient clinical workflow. The team used key informant interviews on site-specific best practices; direct observation of colorectal cancer screening CDS to identify barriers and facilitators to workflow integration; rapid prototyping of design alternatives based on findings from the direct observations; and controlled simulation to test the impact of design on efficiency, usability, and workload.

The three study participants—the Regenstrief Institute, the Department of Veterans Affairs (VA), and Partners Healthcare System—use different EMRs but are all institutions that have improved quality and efficiency by using CDS.

During the first phase, the team conducted site visits to collect qualitative data on factors for effective integration of CDS into clinical workflow in different EMRs. In the second phase, measurable attributes from phase one, including efficiency, usability, and workload were used to develop and test alternatives for improved clinical workflow integration in a simulated setting with experienced users.

Project Objectives:
• Identify key approaches to CDS development for colorectal cancer screening at two VA Medical Center sites and two nationally recognized non-VA sites to obtain effective CDS integration into clinical workflow. (Achieved)
• Develop and test CDS design alternatives for improved integration into clinical workflow through a controlled simulation study and subsequent implementation. (Achieved)

2010 Activities: During 2010, the project team continued to analyze data from the first phase of the project and develop manuscripts. Additionally, the team conducted and analyzed data from experiments in the second phase. For this phase, the team developed prototyped design enhancements to the Veterans Health Administration’s (VHA’s) colorectal cancer (CRC) screening clinical reminder to compare with the VHA’s current CRC reminder. These enhancements were based on barriers discovered during the field work in the first phase. In a controlled simulation experiment, 12 primary care providers used...
prototypes of the current and redesigned CRC screening reminder in a within-subject comparison for four simulated patient encounters. Quantitative measurements were based on a usability survey, workload assessment instrument, and workflow integration survey. They also used ‘think aloud’ techniques during the scenarios and a debriefing session to collect qualitative data.

This work has resulted in numerous dissemination activities, including a poster titled, “Impact of a Redesign for Colorectal Cancer Screening Computerized Decision Support” and a presentation titled, “Investigating Integration of Computerized Decision Support into Workflow at Three Benchmark Institutions”, which were presented for the Veterans Affairs Health Services Research and Development Service 28th Annual National Meeting in February 2011.

**Preliminary Impact and Findings:** The team found very different forms of EMRs and CDS across the sites. Despite design differences, there were common generalizable barriers. These barriers included: 1) lack of coordination among “outside” exam results, primary care, and specialty care; 2) poor data organization and presentation; 3) omission of provider and patient education in the decision support tool; 4) lack of interface flexibility; 5) the need for technological enhancements; 6) unclear role assignments; 7) organizational issues; and 8) disconnect between decision support and quality reporting.

Design enhancements to the VHA’s existing CRC screening clinical reminder positively impacted aspects of usability and workflow integration, but not workload. The qualitative analysis revealed broad support across participants for the design enhancements with specific suggestions for improving them even further. This type of lab-based human factors evaluation of CDS and other informatics tools is critical for testing design changes prior to implementation.

Overall, the team found that identifying effective strategies in the design, implementation, and integration of CDS into workflow is crucial for effective cognitive support. Despite the use of several different health systems, barriers were quite consistent. Effective design and integration of new technologies requires mindful iteration. New CDS prototypes are needed which: 1) improve data organization and presentation; 2) integrate outside results; and 3) provide just-in time education and cognitive support. Designing and testing prototypes using these features may help inform the next generation of cognitive support.

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use
Synthesis Reports for Grants and Cooperative Agreements for Transforming Health Care Quality Through Information Technology

Principal Investigator: Felt-Lisk, Suzanne, M.P.A.
Contract Number: 290-09-000191-3
Project Period: September 2009 – June 2012, Including No-Cost Extension
AHRQ Funding Amount: $744,420
Summary Status as of: December 2010

Target Population: Not Applicable

Summary: The goal of this project is to generate reports that synthesize the experiences of the 118 grants that comprise the Agency for Healthcare Research and Quality’s (AHRQ’s) Transforming Healthcare Quality Through Information Technology (THQIT) initiative. The THQIT initiative is composed of grants funded through four one-time requests for funding announcements (RFAs) including:

• THQIT Planning Grant (HS-04-010)
• THQIT Implementation Grants (HS-04-011)
• Limited Competition for AHRQ THQIT – Implementation Grants (HS-05-013)
• Demonstrating the Value of Health Information Technology Grants (HS-04-012)

THQIT grants were active for varying durations from 2004 through 2009 and were funded to support different aspects of organizational and community-wide activities in health information technology (IT) implementation to elucidate various stakeholders’ perspectives and to demonstrate the value of health IT implementation and use.

This project is collecting data from original grant applications, peer-reviewed literature, and reports from the THQIT initiative to synthesize and report the experiences of the THQIT grantees. A Web-based survey that is tailored by the type of grant will be designed and administered to all THQIT grantees to obtain standardized sets of key information across and within the four RFA groups of grantees. Semi-structured interviews at approximately 40 grantee sites will be conducted.

The framework for the data collection and analysis in this project includes the following questions:

• What features of planning and health IT partnerships were associated with effective planning, implementation and use, and improved health care processes and outcomes?
• What was the role of the grant and associated requirements in shaping the experience and outcomes of the projects, and how might the grant process be improved?
• What financial, organizational, technical, personnel, procedural, or other barriers were encountered, and what strategies have grantees found to overcome them?
• Where and to what extent have the implementation projects documented with strong or suggestive evidence improvements or detriments to patient safety, quality of care, or efficiency associated with their health IT implementations? Are certain project features or characteristics associated with better outcomes?
• What benefits do grantees report and what, if any, potential hazards, care process compromises, or safety incidents have been identified?

Findings and outputs from this project will broaden the knowledge base on how to accelerate health IT implementation, meaningful use, and criteria for future funding and policy decisions.

**Project Objective:**
• Generate reports that synthesize the experiences of the nearly 120 grants which comprise AHRQ's THQIT program. *(Ongoing)*

**2010 Activities:** Literature review summaries were prepared for the THQIT Implementation and Planning grantees, based on a comprehensive review of published and “gray” literature related to the grants, including their final reports to AHRQ. Also, the team prepared eight quality improvement stories to summarize for a lay audience the experience of eight pioneering grantees with useful results representing a variety of technologies, settings, and patient populations. In addition to reviewing grantee reports and related literature, the team contacted the principal investigators to obtain updated information on the projects. AHRQ published the compilation in September 2010. The project team also developed and pre-tested a survey instrument and grantee interview guide for planning, implementation, and value grantees, and prepared the Paperwork Reduction Act package for the Office of Management and Budget’s review.

**Preliminary Impact and Findings:** Since publication in September 2010, the report *Using Health IT: Eight Quality Improvement Stories*, has been widely cited in the press. The stories provide examples of grantees who experienced increased efficiencies in health care delivery, improved quality of care, and increased access to care as a result of their health IT efforts. Six of the eight projects emphasized health IT applications for vulnerable populations, such as minority and low-income groups, the elderly, children, and rural communities. Many of the THQIT projects featured in the report sustained, expanded, or transferred their health IT to other settings, health care areas, or populations after the grant period ended. In addition, the THQIT projects that were featured in the report and took place in nursing home and emergency medical services settings have sparked discussions on health IT in those settings—which have been adopting health IT later than hospitals and large physician groups—and have encouraged the development of new software features that benefit related care.

The literature review summary for implementation grantees found that relatively few (13 of 54) were able to report good evidence of the effects of their projects. However, those that did tended to find improved quality of care. The positive impacts included reduction in adverse drug events, reduced emergency department visits, and better adherence to care protocols. All five of the projects that attempted to show a reduction in medical errors from their health IT succeeded in this goal. Grantees whose projects demonstrated more positive impacts noted that various additional improvement efforts, such as workflow redesign or simultaneous attention to improving patient safety culture, were important to their success.

The literature review also found two common barriers that had a major impact on the implementation grant projects: 1) difficulties integrating the new IT with existing IT systems or workflows; and 2) uneven commitment among partner organizations. Common facilitators included change-management strategies for planning and communication, involving stakeholders in design and implementation, and managing a milestone-based project plan; the importance of a champion to serve as lead advocate for health IT use; and the importance of ‘super-users,’ onsite individuals with designated time to help others adjust to and learn to use the health IT.
The literature review summary for planning grantees identified barriers, strategies used by grantees who managed to avoid them, and benefits reported in published sources. The five most-frequently mentioned barriers were: 1) difficulty obtaining sufficient input from intended users; 2) budget planning to support implementation; 3) difficulty defining and purchasing necessary hardware and infrastructure improvements; 4) difficulty achieving trust and strong working relationships with collaborating organizations; and 5) privacy and security concerns.

Examples of strategies for avoiding some of these barriers include putting implementing providers in contact with providers who already use the technology; hiring an external expert on health IT implementation to review the benefits and costs of health IT implementation with the administrative leadership; and assessing workflow prior to determining goals for health IT implementation or the type of health IT.

In their final reports to AHRQ, grantees reported several types of benefits including:

- Identification of implementation barriers and the opportunity to include methods to overcome them in implementation plans;
- Assessment of (and in some cases, challenging) the appropriateness of health IT goals and methods, and the opportunity to change course of action for implementation;
- Building partner buy-in regarding the value of technologies and fostering trust in collaboration;
- Facilitation of new relationships;
- Increased knowledge and understanding of the capacities and functions of technologies, as well as the complexities and challenges to successful implementation and integration;
- Increased health IT infrastructure for smaller, resource-constrained providers; and
- Increased awareness of similar health IT projects regionally and nationally.

For the 16 grantees who also received AHRQ implementation grants after receiving planning grants, participating in the planning process was clearly beneficial. It was not clear if and how many received implementation funding from other sources as a result of project planning. However, at least one grantee explicitly stated that without funding from an AHRQ planning grant, funding from another source would not have been obtained.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
The Give Teens Vaccines Study

**Principal Investigator:** Fiks, Alexander, M.D., M.S.C.E.

**Organization:** The Children’s Hospital of Philadelphia Pediatric Research Consortium

**Contract Number:** 290-07-10013-4

**Project Period:** September 2009 – March 2012, Including No-Cost Extension

**AHRQ Funding Amount:** $500,000

**Summary Status as of:** December 2010

**Target Population:** Teenagers

**Summary:** Immunization rates have been designated as one of the leading health indicators for the Nation by Healthy People 2010. They are particularly useful as measures of the quality of pediatric care because immunization schedules are clearly delineated, nationally standardized, and structured to protect children and adolescents from life-threatening illnesses. While much attention has historically been focused on the immunization of infants and young children, recent licensing of new vaccines for adolescents has broadened the population requiring timely vaccination. However, effectively delivering adolescent vaccines, especially the quadrivalent human papillomavirus (HPV) vaccine, has been challenging. According to the most recent National Immunization Survey, rates of HPV vaccination are the lowest for all adolescent vaccines.

The Children’s Hospital of Philadelphia (CHOP) Pediatric Research Consortium (PeRC) is evaluating the impact of clinician-focused and patient/family-focused health information interventions on HPV vaccination rates among adolescents. The PeRC network serves as an integrated pediatric care delivery system, with shared administrative structure and a shared state-of-the-art electronic health record (EHR), EpicCare, which is certified by the Certification Commission for Health Information Technology. This study compares the effectiveness of targeting immunization decision support at families versus clinicians by conducting two parallel trials: a cluster-randomized trial aimed at clinicians and a family-level randomized trial. The planned intervention will employ multiple evidence-based strategies to influence HPV vaccine delivery and receipt in primary care. For clinicians, these include education, clinical decision support, audit, and feedback on vaccination success measured as the proportion of eligible patients seen by a clinician and given the vaccine during each month of the study. Family-focused decision support will remind parents and their adolescent child that the vaccine is due through phone calls that provide educational information on the vaccine, and offer links to additional information on a Web site designed for this project that combines content available through the CHOP Vaccine Education Center.

The evaluation of these two distinct approaches will provide information on the impact of these alternate strategies, alone or in combination, on HPV vaccination rates. The study will advance understanding of how to use health information technology (IT) to engage adolescents and families with clinicians in health decisions and will inform future interventions aimed at improving health for children and adolescents.

**Project Objectives:**

- Determine the impact of clinician-focused, EHR-based decision support at the point of care on the receipt of HPV vaccine among adolescents. *(Ongoing)*
• Determine the impact of family-focused, health IT-based decision support on HPV vaccine receipt (main outcome) and families’ uncertainty regarding HPV vaccination (exploratory). *(Ongoing)*

**2010 Activities:** The family-focused reminder calls and the clinician-focused vaccine alert systems were tested, and went live on May 9, 2010. The alerts have been appearing at the intervention sites whenever a patient encounter is opened in the EHR for a patient due to receive a study vaccine.

At the start of the study, the lead investigator visited the 11 intervention sites and presented information about the study, as well as information on vaccine safety, efficacy, and potential health benefits. Since then, the project team has been delivering feedback reports to clinicians at intervention sites on a quarterly basis, listing the rates of captured immunization opportunities for each provider and practice, as well as the entire care network.

The project team conducted a pilot study involving interviews with 20 parent-clinician-adolescent triads, to learn more about how communication and decisionmaking between clinicians, parents, and adolescent girls may impact HPV vaccine receipt.

A cohort study nested within the larger trial is currently underway to understand in greater detail the impact of the decision support interventions on families and their decisionmaking process. The survey instrument was developed, pilot-tested, and is currently being fielded.

**Preliminary Impact and Findings:** Results of the pilot study are being prepared for presentation at the annual meeting of the Pediatric Academic Societies during April 2011. They will also be discussed at the International Shared Decision Making meeting in the Netherlands during June 2011.

As of December 2010, over 20,000 families and 22 primary care practices have been enrolled in the clinical trial. Data analysis will begin in summer 2011 and will show the relative impact of phone calls and provider alerts for each dose of the HPV vaccine. Additional analyses will help the project team better understand the impact of these systems among adolescents of different ages. The impact of the intervention in suburban and urban settings will also be considered. Beginning in the summer of 2011, the project team will also be analyzing the results of the nested cohort study.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Enabling Patient-Centered Care Through 
Health Information Technology

Principal Investigator: Finkelstein, Joseph, M.A., M.D., Ph.D.
Organization: Johns Hopkins University
Contract Number: 290-07-10061-I7
Project Period: December 2008 – August 2010, Includes No-Cost Extension
AHRQ Funding Amount: $330,000
Summary Status as of: August 2010, Conclusion of Contract

Target Population: General

Summary: The use of health information technology (IT) has been promoted as having tremendous promise for improving the efficiency, cost-effectiveness, quality, and safety of medical care delivery in our Nation’s health care system. Health IT can support patient care-related activities such as order communications, results reporting, care planning, and clinical or health documentation. Customized integration of patients’ information in a health IT application delivered in an accessible, user-friendly format empowers patients and their family members to be active participants in care decisions and in the daily management of their health and illnesses. These are key components of patient-centered care (PCC), which the Institute of Medicine has identified as important to ensuring health care quality and patient safety.

Researchers at Johns Hopkins University drafted an evidence report that is part of a three-report series focused on the Agency for Healthcare Research and Quality (AHRQ) Health IT Portfolio’s strategic goals. This report focuses on the Portfolio’s goal of developing and disseminating evidence on the impact of health IT that enables PCC. Because of the diversity of health IT applications and the different ways to measure their impact, the review includes peer-reviewed scientific literature, as well as conference proceedings. The report explores the following three specific areas related to PCC:

- Shared decisionmaking between the patient and/or family (or caregiver) and clinician.
- Patient-clinician and/or family-clinician communication.
- Access to medical information.

The review was guided by the conceptual framework based on current models of PCC and focuses on clinical outcomes and delivery process outcomes that impact systems, care providers, and patients. Barriers and facilitators of health IT-enabled PCC are presented from the perspective of clinicians, IT developers, consumers, and their families.

Project Objectives:

- Conduct a comprehensive literature review regarding the impact of health IT that enables PCC. (Achieved)
- Develop a final report on the impact of health IT that enables PCC. (Ongoing*)

2010 Activities: The activity throughout the year focused on drafting the final report. After conducting a literature review of over 300 articles, findings on the effectiveness of health IT applications in improving
care processes, clinical outcomes, and intermediate outcomes were synthesized. The draft report was submitted to AHRQ and to a technical expert panel for review. The report is being revised to address reviewers’ comments.

**Impact and Findings:** The findings from this project will be available upon completion of the final report.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support PCC, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

* Work on the report continued beyond the project end date of August 2010.
Development of a Model Electronic Health Record Format for Children

**Principal Investigator:** Finley, Scott, M.D., M.P.H.

**Organization:** Westat

**Contract Number:** 290-2009-00023I-3

**Project Period:** March 2010 – March 2012

**AHRQ Funding Amount:** $4,749,214

**Summary Status as of:** December 2010

**Target Population:** Medicaid, Pediatric*

**Summary:** Existing electronic health record (EHR) systems typically are designed, implemented, and used with an adult patient population in mind and therefore, often do not optimally support the provision of health care to children. Special medical and other considerations that arise in pediatric patient care are often missing or poorly supported.

Westat is collaborating with several organizations to develop and disseminate a model EHR format for children enrolled in Medicaid or Children’s Health Insurance Programs. The “format” refers to the various requirements around data elements and standards, usability, functionality and interoperability. The project team is working to understand how the model format, its structure and content can be used to develop new or enhance existing EHR products to help providers optimize health care for children. The goals of this project will be supported by a technical expert panel to ensure broad stakeholder input at every stage of the project. Two Children’s Health Insurance Program Reauthorization Act grantees also will test and evaluate the format’s impact on quality and cost of care outcomes.

The outcome of this project will identify core elements of an EHR for children that can be incorporated into vendor systems, and will provide guidance to users of EHRs about the ideal functionality of EHRs for children.

**Project Objectives:**

- Conduct an environmental scan and gap analysis. **(Achieved)**
- Develop a model EHR format for children that can be used readily **(Ongoing)**
- Package the EHR format in a way that facilitates broad incorporation into EHR systems. **(Upcoming)**

**2010 Activities:** The focus of activity was on conducting the environmental scan and gap analysis. Development of the model EHR format is also underway.

**Preliminary Impact and Findings:** The environmental scan and gap analysis suggest that existing EHR systems and products lack a number of functionalities related to over 30 topic areas (e.g., growth data, newborn screening, medication management, etc.) related to the treatment of children and for which the project is currently developing requirements.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Assessing the Impact of the Patient-Centered Medical Home

Principal Investigator: Fontaine, Patricia, M.D., M.S.
Organization: University of Minnesota
Contract Number: 290-07-10010-4
Project Period: July 2009 – December 2010
AHRQ Funding Amount: $249,990
Summary Status as of: December 2010, Completion of Contract

Target Population: General

Summary: The Patient-Centered Medical Home (PCMH) model is a vehicle for addressing operational characteristics of health care practices to maximize accessible, comprehensive, family-centered, coordinated, compassionate, and culturally effective care. However, many unanswered questions about potential benefits, drawbacks, and requirements for transforming and maintaining practices point to the need to evaluate the model. Some of the challenges to evaluating the PCMH model include the constantly changing environment of health care, the varying definitions for the term “medical home”, and the lack of valid measures for many of the features included in those varying definitions.

HealthPartners Research Foundation is striving to inform policy by evaluating the economic and quality outcomes of mature PCMH clinics in the HealthPartners Medical Group (HPMG) system. HPMG is a multispecialty group in the metropolitan region of Minneapolis and St. Paul, Minnesota, that includes approximately 700 physicians, 40 percent of whom practice primary care in 21 clinics throughout the region. HPMG has been implementing elements of the PCMH concept since 2000, and in 2009 they were all recognized as functioning at PCMH level III, which is the highest level granted to those practices that are meeting the required elements and factors that compose the standard as defined by the National Committee for Quality Assurance (NCQA). The central hypothesis of the study was that a clinic’s level of PCMH is significantly associated with higher quality, increased patient satisfaction, and reduced resource use.

The data that supported this analysis came from HealthPartners’ administrative and clinical databases. These databases provide quality and resource-use data corresponding to HealthPartners members receiving care at any contracted Minnesota-based medical group. As such, they comprised a retrospective cross-section. All patients treated in HPMG clinics were eligible for the analysis; however, the quality outcome variable determined the data used in support of each model. For instance, childhood immunizations were limited to a pediatric population, while diabetes quality indicators were limited to a diabetes population.

This study has the potential to impact the current understanding of the potential benefits of the PCMH, aid in identifying the PCMH domains most strongly related to those benefits, provide policymakers with valuable information regarding what to expect from widespread PCMH adoption, and provide medical leaders with insights into the PCMH aspects of most importance.

Project Objectives:
- Determine the associations between PCMH measures and the quality and patient satisfaction with care provided by HPMG clinics. (Achieved)
• Determine medical resource use within HPMG clinics. **(Achieved)**
• Identify trends in quality, satisfaction, and resource use occurring within HPMG clinics. **(Achieved)**
• Determine whether any identified trends differ significantly from the general secular trend occurring across Minnesota-based medical groups. **(Achieved)**

**2010 Activities:** This project was conducted in two phases; phase 1 was from July through December 2009. Phase 2 ran from January through December 2010 and comprised a longitudinal analysis of quality, patient satisfaction, and cost trends over time. Trends were examined within the 21 HPMG clinics and then expanded to the larger context of medical groups, by examining trends within non-HPMG as well as HPMG clinics.

**Impact and Findings:** During the first phase of the study, an analysis of the first and second aims was completed with the following findings:

• Although there was substantial variation among these clinics in scores on a variety of satisfaction and quality measures as well as on the overall and component scores from the Physician Practice Connections-Readiness Survey (PPC-RS) measure of medical home-ness, there was no relation between PPC-RS scores and either quality or satisfaction. This suggests that any association may have been obscured by the lack of sufficient heterogeneity among these clinics or, possibly, by a relation that would only appear over time.

• While the same lack of association was found for utilization and cost for all patients, there were some significant associations for the subgroup of patients with multiple prescriptions, suggesting that complex patients with more co-morbidities would have cost benefit from care in a PCMH.

• Patients receiving more than 50 percent of all primary care from within one of these certified PCMH clinics did have a reduction in the number of visits per year to both primary care and specialist providers, which was also associated with lower costs for those services.

During the second phase of the study, analysis of the third and fourth aims was completed with the following findings:

• Over a 3 to 5 year time period, these NCQA level III clinics achieved a 1 to 3 percent annual increase in patient satisfaction and a 1 to 4 percent annual increase in adherence to quality measures for diabetes, coronary artery disease, preventive services, and generic medication use.

• When compared to the average for other medical groups in the region, these increases were greater for only some of the measures, and in several instances they only allowed these clinics to catch up to the community average.

• There was again no relationship between PPC-RS scores for clinics in 2009 or medical groups in 2005 and the quality and patient satisfaction trends over time.

• For cost and utilization, higher PPC-RS scores for medical home-ness were associated with lower emergency room use in all years. However, overall resource use was lower only among complex patients receiving multiple prescriptions within those clinics with higher PPC scores.

Findings from the first phase of the study were published in the *Journal of Ambulatory Care Management* in January 2011. In addition, two additional manuscripts have been submitted, one to Health Services Research and the other to the Annals of Family Medicine, covering the findings in Phase 2. Two other manuscripts on cost and utilization will be submitted in May 2011.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
“First, Do No Harm”: Using Health Information Technology to Reduce Use of Preventive Services with Potential Harms

**Principal Investigator:** Genevro, Janice, Ph.D.

**Organization:** Professional and Scientific Associates

**Contract Number:** 290-09-00032U

**Project Period:** September 2009 – September 2010

**AHRQ Funding Amount:** $64,937

**Summary Status as of:** September 2010, Completion of Contract

**Target Population:** Not Applicable

**Summary:** Working toward the provision of high quality health care and good health outcomes means that information about health care services that should not be provided—whether preventive services or treatment—is also important to protect patients from harm. However, formative research and feedback from practicing clinicians indicates that it is extremely difficult to communicate “don’t do” recommendations effectively. As providers move to digitized health records, they expect that decision support systems will effectively communicate “don’t do” recommendations as well as other types of health care information. This discrepancy between expectation and reality creates an opportunity to explore the best ways to achieve the desired state.

This project facilitated an Agency for Healthcare Research and Quality (AHRQ) meeting in March 2010, at which approximately 20 experts in evidence-based recommendations and guidelines, health information technology, bioinformatics, cognitive psychology, and health communications discussed ways to improve clinical decision support for preventive services with potential harms. The purpose of this 1-day meeting was to identify a research agenda and potential next steps in this area.

**Project Objectives:**

- Convene an expert meeting of approximately 20 participants to discuss methods of communicating “don’t do” recommendations. **(Achieved)**
- Identify a research agenda and potential next steps in developing “don’t do” recommendations effectively. **(Achieved)**

**2010 Activities:** Activities included the development of two white papers that helped prompt discussions at the meeting, conducting the 1-day meeting in March to identify a research agenda and next steps, and developing a meeting summary. In addition, the steering committee created a plan to disseminate reports and other products developed for, or as a result of, the meeting.

**Impact and Findings:** The papers developed as the result of the meeting are under review by AHRQ.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
Effective Use of e-Prescribing in Physician Practices and Pharmacies

Principal Investigator: Grossman, Joy, Ph.D.
Organization: Center for Studying Health System Change
Contract Number: 290-05-0007-3
Project Period: February 2009 – February 2011
AHRQ Funding Amount: $374,635
Summary Status as of: December 2010

Target Population: General

Summary: This project addresses the need for qualitative research about the effects of electronic prescribing (e-prescribing) on physician and pharmacy practice and communication. The potential gains from e-prescribing assume that prescribers and pharmacists have access to and make use of the required features. Limited research on the topic suggests that not all e-prescribing systems have the full range of features promoted under financial incentive programs established by the Medicare Improvements for Patients and Providers Act of 2008 and the American Recovery and Reinvestment Act of 2009. Further, even when the features are available, physician practices face barriers to implementing them effectively. Even when the features are implemented at the practice level, physicians may not use them. To gain the benefits from electronic transmission of prescriptions, both physician practices and pharmacies must routinely use systems enabled for two-way electronic communications. Several studies have identified obstacles in both the physician and pharmacy settings that include information technology system limitations, workflow and training issues, and real or perceived regulatory barriers.

The Center for Studying Health System Change (HSC), a non-partisan health policy research organization in Washington, D.C., is conducting a qualitative study exploring physician use of third-party information (i.e., medication histories, formularies, and generic medication alternatives) at the point of prescribing and physician practice and pharmacy use of electronic routing features. Information collected by the study will inform strategies for governmental and private health care organizations to promote adoption and effective use of e-prescribing capabilities.

Project Objective:
• Explore how e-prescribing features are implemented and used by physicians and pharmacies with a focus on selected features that have the potential to yield health care quality and cost benefits but that prior research has shown not to be available or used routinely by significant proportions of e-prescribers. (Ongoing)

2010 Activities: The project team completed data collection during 2010. Approximately 115 interviews were conducted with representatives of physician practices and pharmacies located in twelve nationally representative communities that have been studied longitudinally since the mid-1990s as part of HSC’s Community Tracking Study, as well as with other local and national stakeholder organizations. The purpose of the interviews was to explore the effects of e-prescribing among users who electronically send or receive prescriptions directly to or from their e-prescribing system, rather than by stand-alone
or computer-generated fax. Interviews collected information on physician access to and use of third-party information, physician practice and pharmacy use of electronic routing features, facilitators of and barriers to their use, and the effects of e-prescribing on pharmacies ability to process prescriptions and physician practice-pharmacy communications.

**Preliminary Impact and Findings:** Findings will be made available in two publications: one on physician use of third-party information at the point of prescribing and a second on physician practices’ and pharmacies’ experiences transmitting and processing electronic prescriptions.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Knowledge Creation
Using Evidence-Based Nursing Practices and Electronic Health Record Decision Support to Reduce Fall-Related Patient Injuries in Acute Care

**Principal Investigator:** Hook, Mary, Ph.D., R.N, P.H.C.N.S.-B.C.

**Organization:** Aurora Health Care System Nursing Research

**Contract Number:** 290-06-0016-2

**Project Period:** June 2009 – January 2011

**AHRQ Funding Amount:** $387,369

**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** Advances in health information technology (IT), particularly the use of clinical decision support systems (CDSS) in an electronic health record (EHR), hold great promise for enhancing the safety, quality, effectiveness, and efficiency of patient care. However, limited use of these advances by nurses has been reported. Many nurses continue to develop, implement, and document their care plans on paper with little automation, limited access to CDSS, and manual abstraction for quality reporting. Research on how, when, and where CDSS can be used to increase quality and patient safety for acute-care nurses is needed.

This project, a joint collaboration between investigators at the Aurora Health Care System Nursing Research, the University of Wisconsin-Milwaukee Colleges of Nursing and Health Sciences, and Cerner Corporation, added new tools to an existing CDSS within an EHR to help nurses individualize care for groups of patients and improve fall and injury prevention processes and outcomes. The team used evidenced-based recommendations and input from academic partners, fall prevention, technology acceptance, and cost-benefit analysis experts to develop a data dictionary, qualitative and quantitative assessment measures, and CDS design.

The project was implemented with nurses who worked on two medical or telemetry magnet-recognized nursing care units in one large urban medical center in the Midwest. The facility had a pre-existing EHR with nurse-sensitive fall prevention and injury management data elements, electronic care planning functionality, and CDSS that identified fall and fall-related injury risks using data entered during patient care. This CDSS project involved the creation of two new electronic reports for nurses. One report displayed selected patient risk factors and planned interventions to support nurses to evaluate and adjust their care plans (CP) for individuals and groups of patients at a key point in their workflow. The other report displayed retrospective data about fall prevention care and fall event details that unit-based nurse leaders can used to tailor quality improvement (QI) efforts. In addition to creating the reports, the team developed patient and family education (ED) materials, staff and nurse leader education materials, and a dictionary of standardized terminology. A pre-post mixed-methods design, including data queries, direct unit observation, focus groups, surveys, and usability testing was used. Qualitative and quantitative measures were used to identify recommended tool content and logistical design and evaluate post-implementation outcomes.
Evaluation results were disseminated to key clinical and informatics leaders to influence future work in this area. The data dictionary, support tools, findings, and lessons learned will contribute to the available knowledge of improvements in patient safety and quality of IT-supported nursing care and help reduce CDSS development and implementation costs. It also will serve as a prototype for future development.

**Project Objective:**

- Design, build, and implement CDS tools that were populated with data extracted from the EHR and to evaluate if the CDS tools could support nurses to improve care planning and quality improvement activities, and patient or family education related to fall prevention in acute care. *(Achieved)*

**2010 Activities:** The team reviewed the baseline findings to inform the content and logistics of tool design and establish the following goals for the design of each CDS tool:

1. The CP-CDS tool needed to be accessible in nursing workflow and able to display information about all assigned patients, with a visual display (quick and easy to see without reading) of risks, risk-based interventions, and fall events.
2. The QI-CDS tool needed to provide electronic access to data currently gathered manually from multiple sources, near-real time, with accurate and complete data capture.
3. The Fall Prevention ED tool needed to be easy to read with pictures to help nurses teach patient-specific risks and talk through prevention strategies to address risks.

The CDS tools were populated with valid and reliable near-real time EHR-based data to support CP and QI related to fall prevention. The CP, QI, and ED CDS tools were made available to clinicians and nurse leaders.

A metadata dictionary of the standardized, defined, and coded data elements used in constructing the tools was created and imported into the United States Health Information Knowledgebase with the technical specifications to support interoperability and use of the tools by other organizations.

**Preliminary Impact and Findings:** Despite providing input into design, the nurses and nurse leaders were slow to adopt the tools. The CP-CDS tool was available in the EHR with a single click but staff perceived this to be outside the workflow. Slow load time and insufficient assessment and intervention details contributed to limited CP-CDS adoption. QI-CDS tool usability testing showed that leaders could access the tool and believed the tool brought disparate data together, saving time and improving data quality, but leaders found no time to use the tool. Similarly, staff nurses provided positive feedback about the Fall Prevention ED tool, but there was limited evidence of use during the post-implementation period. Sociotechnical issues, such as competing EHR implementations and resource reduction, were observed during training, go-live, and adoption periods and may have influenced adoption.

This study demonstrated that nurse-sensitive data, embedded in the EHR can be captured and extracted from the data repository to create tools that support decisionmaking during patient care and to populate CDS tools for aggregate analysis and quality improvement. The CDS tools were not adopted as well as expected, possibly due to the presence of sociotechnical issues that are not typically captured in CDS research. Transitioning to data-driven processes may require more time, knowledge, and skills in order for nurses to effectively use tools to support decisionmaking. Despite limitations, this study sheds light on the complexities of nursing workflow, the need to better understand sociotechnical contexts, and how CDS tools can support nurse decisionmaking.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Implementation and Use
Evaluation of AHRQ’s On-Time Pressure Ulcer Program

Principal Investigator: Hurd, Donna, M.S.N.
Contract Number: 290-06-0011-8
Project Period: June 2009 – January 2012
AHRQ Funding Amount: $1,699,797
Summary Status as of: December 2010

Target Population: Elderly*

Summary: Pressure ulcers and injurious falls have serious health and economic consequences for elderly residents in nursing homes. Substantial research has documented that prevention of pressure ulcers and falls is possible, yet these problems persist across health care settings. Many initiatives to improve quality of pressure ulcer care in nursing homes have been undertaken in the last decade, including the Agency for Healthcare Research and Quality (AHRQ) funded On-Time Pressure Ulcer (PrU) Healing Project which helps nursing homes implement best practice guidelines in PrU care through workflow redesign and process improvements. While the On-Time program has unique characteristics, it has not yet been formally evaluated and thus is not ready for wide dissemination.

The evaluation of the On-Time PrU Program will help make guidelines available to other practices. Lessons learned from the PrU program will also serve to inform the development of an On-Time Fall Prevention Module, which will use documentation data elements, actionable reports, and tracking tools on risk factors from the On-Time PrU program. These resources will allow nursing home staff to intervene in a timely manner with at-risk residents to reduce the incidence of injurious falls. The project team will work with facilities to develop a feasible implementation plan to integrate these tools into daily practice.

A yearlong process of workgroup meetings informed the standardization of fall documentation and the development of tools to guide clinical decisionmaking for fall prevention. In addition, six to eight facilities are participating in a series of teleconference calls to develop health information technology (IT) specifications based on the final set of fall prevention tools. Since December 2009, the scope of work has also been expanded to include two additional tasks including: 1) a review of literature and analysis of national data to identify residents in nursing homes who should be targeted for prevention protocols to reduce hospital and emergency department (ED) visits, and 2) development and testing of a training curriculum for the On-Time Pressure Ulcer Prevention Program and modification of the Team Strategies and Tools to Enhance Performance & Patient Safety (TeamSTEPPS) program for nursing homes.

Project Objectives:

• Evaluate the effect of the On-Time PrU by comparing 15 New York nursing homes that have implemented the program with 12 to 15 control nursing homes. Information on pressure ulcer incidence provided by the facilities for a 12-month period and adjusted for resident risk factors using minimum data set data will provide the data needed to assess the effectiveness of the On-Time program for reducing pressure ulcers. (Ongoing)

• Design the tools and establish the foundation for a fall prevention implementation effort using
an approach similar to the On-Time PrU prevention, including standardized documentation data elements that can be integrated into everyday practice, actionable reports of resident fall risk factors, and tracking tools. (Ongoing)

- Develop an evidence-based systems approach for identifying, managing, and monitoring multiple risk factors for hospitalizations and ED visits. (Ongoing)
- Develop the On-Time Train-the-Trainer and TeamSTEPPS for long-term care Curricula. (Upcoming)

2010 Activities: Many project-related activities were achieved throughout the year. Thirteen control facilities were selected based on their similarity to the intervention facilities. Site visits were scheduled with each control facility and four site visits were completed by the end of the year. The project team also continued to work with the intervention facilities throughout the year, assisting them with submitting their patient census and pressure ulcer data. A majority of the facilities have submitted all the required data and the remaining facilities have submitted at least a portion of the required data.

The draft fall prevention tools were reviewed with members of the Advisory Panel in September and October to get their feedback and input. A preliminary draft of health IT specifications was developed as part of these materials. The Advisory Panel provided recommendations on the tools and the final versions were delivered to AHRQ in December. Included in the tools were:

- Standardized set of documentation data elements and definitions
- Clinical Reports and Tracking Tools
- Falls Prevention: High Risk Report
- Falls Quality Improvement Monitor Reports

The avoidable hospitalization literature review was completed in August and revisions to the summary are in progress. Data collection of the nursing home stay information was delayed because the initial files had been copied onto cartridges, which the project team was not able to read. Subsequent negotiation with the Centers for Medicare and Medicaid Services allowed for the data to be provided in another format and was received by the project team in November. During the delay, the project team focused on defining diagnosis codes for identifying hospitalizations and ED visits.

In addition to having an Advisory Panel, a Technical Expert Panel is in the process of being established and AHRQ has approved the list of potential candidates. The analysis plan is also being finalized as the analytic files and variable definitions are developed.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation

* AHRQ Priority Population
## Using Innovative Communication Technology to Improve the Health of Young African-American Women

**Principal Investigator:** Jack, Brian, M.D.  
**Organization:** Boston University  
**Contract Number:** 290-06-0012-7  
**Project Period:** July 2009 – April 2011  
**AHRQ Funding Amount:** $399,504  
**Summary Status as of:** December 2010

**Target Population:** Racial or Ethnic Minorities*: African Americans, Teenagers, Women*

**Summary:** Clinical health care for young women has been a focus of national attention since the 1980s, when research revealed significant racial disparities in pregnancy outcomes. At that time, national programs to improve poor pregnancy outcomes centered largely on providing care for women during pregnancy and helping women enter prenatal care early were initiated. This project is part of an emerging effort to engage young adults and improve their health before they are pregnant.

The project includes the development of an intervention to promote the health of African American women who are 15 to 21 years old. It uses theory-based behavioral change techniques and an existing clinical patient education system—the Virtual Patient Advocate (VPA)—to deliver the behavior change intervention. The VPA is an innovative communication channel that features an animated computer character that simulates face-to-face conversation with patients via the Internet. Aspects of this technology have been previously applied by the researchers to provide patient education at hospital discharge. This VPA system will feature novel social networking capabilities to increase the reach and efficacy of the new intervention.

Study staff will conduct focus groups to solicit participants’ recommendations to maximize the target population’s uptake of the system by building relevant behavioral messages and ensuring that the VPA system is convenient and easy to use. The system will be adapted from the VPA originally designed for the ReEngineered Discharge program (Project RED) to provide: 1) a personalized and comprehensive assessment of preconception risks, 2) culturally appropriate health promotion messages, and 3) an individualized behavior change discussion for each risk identified. This integration of social networking technologies will increase the reach of the intervention while increasing adherence to its recommendations.

**Project Objectives:**

- Design a new VPA for a Web-based behavior change and patient activation system that is informed by qualitative research with the target audience. *(Achieved)*
- Develop VPA dialogue for 15- to 21-year-old African American women. *(Achieved)*
- Develop a social networking interface that allows users to recommend other people who could benefit from the intervention, and perform a proof-of-concept test of this new system to improve the health of African American women. *(Achieved)*
- Analyze the impact of the newly designed system. *(Ongoing)*
- Disseminate this new technology to at least two other academic medical centers. *(Ongoing)*
2010 Activities: Pre-testing was done with 20 participants and included observation of participants’ use of all program phases: risk assessment, intervention with VPA, listening to and writing stories, and creating a My Health To-Do List. The team conducted one-on-one interviews with participants. As the focus of this project is to develop a Web-based education system, it was decided that at the initial stage of development both usability testing and pilot testing would be used for eliciting feedback and suggestions for future development.

Current development of the VPA system is complete and the programming team is inputting and revising scripts. Using the template created by the study team, all scripts have been drafted for the complete set of 74 health risks. Each woman hears the scripts delivered by the VPA that correspond to her personal health risks. The scripts include a basic description of the risk and how it pertains to her current and any future pregnancies. The woman can decide to add the recommended action to her plan. If she chooses to add it, the VPA will suggest other relevant activities, such as talking to her family, partner, or provider; learning more information; or hearing a story from another participant. If she chooses not to add the item to her plan, the VPA will ask her to explain why. Women who have already successfully addressed a specific risk will be encouraged to share their stories.

Web forms for patients to answer screening questions before their first conversation with the VPA have been developed. Edits and suggestions from 19 experts from the National Advisory Board have been incorporated into the Intake Questionnaire and VPA scripts. The next version of the system will be sent to the National Advisory Committee. The basic health information provided through the scripts is complete and efforts are now focused on ways to use information gathered through the intake questionnaire to tailor the scripts to the individual participant. The Stages of Change assessment for each health risk was written and programming completed. The assessment will determine which stage of change the user is in for each of her risks at intake and at 2-month followup. In this manner, the project can track any risk-reduction progress made.

The team is developing a platform to give participants story-authoring capabilities so they can share their experiences overcoming individual health risks. Audio and video transformations to automatically de-identify participants’ recorded stories were reviewed, but the team concluded that they do not offer sufficient privacy guarantees. The team also reviewed research on encouraging knowledge sharing in social networks and decided to provide a feedback system to participants so that they know when others have heard their stories and whether the stories were useful. A story-authoring tool was developed that lets users contribute stories by first writing text then “storyboarding” the story by adding static images of one of six avatars and 12 possible poses developed by the team. Additionally, the team has written the stories necessary to pre-populate the system with one story per risk, so that there are stories available for early users.

Participants in the focus groups conducted in October reviewed the draft “Reproductive Life Plans,” which is called the “My Health To-Do List.” Overall feedback was positive, with suggestions for changes in design and color. Participants stressed the importance of having the choice to print the document or view online only. Programming of the My Health To-Do List will be pre-tested after focus group feedback has been incorporated.

Preliminary Impact and Findings: The team has conducted a total of eight focus groups to guide the development of the VPA system. A formal analysis will be conducted at a later date. Below are preliminary key findings:
**VPA appearance:** Early focus groups chose the VPA character for the program and later focus groups decided that either the name “Leela” or “Gabby” would fit. The system is now called the “Gabby system”.

**Stories:** The team found that participants preferred shorter stories. The team has written seed stories for the system that are about six sentences long. Participants also indicated that the stories should be in first person and from the perspective of the system users instead of the VPA agent. Participants did not want a lot of slang or informal language in the stories. Finally, focus group participants wrote their own stories. Those deemed appropriate will be used in the system.

**Social Networking:** Participants across all eight focus groups confirmed that they use Facebook and that the system should have at least some Facebook-like functionality, or even be integrated into Facebook. For this phase of development, they will include Facebook-like features, such as “like” buttons for stories and a pseudonym given to each user.

**Intake Questionnaire:** Participants thought that overall the layout and design of the questionnaire was straightforward and easy to navigate. However, they recommended changing the progress bar at the top to show the names of the different pages and those completed instead of a percentage to indicate progress because they found the percentage to be discouraging. Also, participants thought that the questionnaire was quite long and would prefer the option to complete over multiple sessions.

The system was presented to 15 pre-testers who were taught to use the system. The project staff gathered quantitative and qualitative feedback about the system from these patients, and their physicians were interviewed by a qualitative researcher using open-ended questions. The pretesting showed that the system works well, there were few problems, participants liked the system, and two-thirds stated that their interaction with the system would help them to change some aspect of their health or health care.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
## Electronic Health Record Usability Toolkit

**Principal Investigator:** Johnson, Constance, M.D.  
**Organization:** Westat  
**Contract Number:** 290-09-000231-7  
**Project Period:** August 2010 – April 2012  
**AHRQ Funding Amount:** $429,469  
**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** While health information technology (IT) systems are expected to significantly reduce medication errors, studies have found that issues with usability can actually facilitate errors or decrease the efficiency gains made possible by health IT. While electronic health records (EHRs) might be an improvement over their paper predecessors, studies reveal that many of today’s systems scatter important data that clinicians need for a single-patient encounter.

A project team comprised of staff from Westat’s Center for Health IT, the School of Nursing at Duke University, the Center for Health Information and Decision Systems at the University of Maryland at College Park, and the American Academy of Family Physicians will design, develop, test, and disseminate a toolkit with which health care organizations—specifically primary care practices—can assess the usability of their EHR system. Audiences for the toolkit also include health IT vendors and certification organizations. Development of the toolkit will increase attention to the importance of EHR usability and help promote design of systems that better support proper diagnosis, identification of high-risk patients, tracking of patient health parameters over time, and population health management.

A background report will identify and assess a range of usability methods, metrics, and instruments, and will provide specific recommendations to include in the toolkit. A preliminary EHR usability toolkit will then be developed based upon these recommendations and subsequently tested in nine primary care practices with nine EHR systems developers, and in one EHR certification organization. The findings from these pilot tests will inform a final version of the toolkit before it is disseminated.

**Project Objectives:**

- Develop background report. (Ongoing)
- Develop and refine a toolkit for primary care clinicians that supports rapid yet meaningful usability evaluations of their currently-implemented EHRs. (Upcoming)
- Disseminate the toolkit to increase awareness about the importance of EHR usability, to promote use of evidence-based usability evaluation methods, and to stimulate collaboration among entities developing and implementing EHR systems. (Upcoming)
- Inform EHR accreditation efforts on usability, including those by the National Institute of Standards and Technology. (Upcoming)

**2010 Activities:** Activities focused on conducting the initial kickoff call between the Agency for Healthcare Research and Quality and the project team; as well as developing the work, project, and compliance plans. In addition, the expert panel and workgroups were established and have begun convening meetings via
Web-enabled teleconferences. The five topic areas on which workgroups have been established are: 1) approaches to assessing usability; 2) toolkit development approaches; 3) evaluation of the proposed toolkit throughout its development cycle; 4) assessment of the testing plan and results; and 5) dissemination plans. Lastly, the project team began developing the background report.

**Preliminary Impact and Findings:** This project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Using Health Information Technology to Improve Health Care Quality in Primary Care Practices and in Transitions Between Care Settings

Principal Investigator: Krist, Alexander H., M.D., M.P.H.
Organization: Virginia Commonwealth University
Contract Number: 290-07-10011-3
Project Period: September 2009 – March 2012, Including No-Cost Extension
AHRQ Funding Amount: $499,982
Summary Status as of: December 2010

Target Population: Adults

Summary: There is a major discrepancy between the American public’s perceived value of personal health records (PHRs) and the actual use of PHRs. Only 2.7 percent of Americans have an electronic PHR even as 79 percent report that they believe an online PHR would “provide major benefits to managing their health.” Similarly, there are low rates of electronic medical record (EMR) use among clinicians. Only 17-to-24 percent of outpatient clinicians have an EMR, a mere four percent of which are considered fully functional. This low use of health information technology (IT) occurs at a time when the Nation is looking at health IT as an essential tool to reform health care, improve quality of care, coordinate care delivery, and reduce costs. For small- to medium-sized primary care practices implementing health IT, financial and technical resource limitations often require the adaptation of technology that is already available.

This project will assess methods of creating PHRs from existing EMR systems at small- to medium-sized primary care practices. For this project, a PHR is defined as a nonproprietary, prevention-focused record. When integrated with a clinician’s EMR, it is termed an “interactive preventive health care record” (IPHR). The IPHR called MyPreventiveCare incorporates clinical decision support software, a reminder system, tailored educational materials, and decision aids into one package for patients and clinicians. A previous study showed IPHRs to enhance clinician-patient communication and increase the delivery of recommended preventive services by 3-to-12 percent. The proposed study builds on those findings to evaluate whether the IPHR can be applied in health care settings that use different EMRs.

The study is being conducted in six practices that use Certification Commission for Health Information Technology-certified products (Epic EMR or A4 EMR), and cover a range of service areas (rural, suburban, and urban), and size (from two to 10 clinicians). Through a series of learning collaboratives, study staff will guide practices in creating a shared vision for IPHR implementation. Separate learning collaboratives will be conducted at each practice before and after IPHR implementation. In order to engage practices and create change, the study team will work toward eight components: 1) securing leadership buy-in and support; 2) creating a culture that is conducive to change; 3) establishing a sense of priority; 4) forming a guiding coalition; 5) developing and communicating a shared vision; 6) empowering members to act on the vision; 7) planning for short-term wins; and 8) consolidating and institutionalizing improvements.
Project Objectives:

- Determine whether the study sites can begin implementing the IPHR. (Ongoing)
- Measure the utilization and effectiveness of the IPHR. (Ongoing)
- Determine the necessary steps and procedures that practices need to follow or avoid in order to implement the IPHR successfully. (Ongoing)

2010 Activities: The study team continued working with six study sites. MyPreventiveCare was integrated into the EMR of two sites in October 2010. These sites had all staff and providers establish MyPreventiveCare accounts for themselves and for test patients, and providers began offering MyPreventiveCare to all patients. Sites used a variety of advertising and outreach methods to encourage patient participation in MyPreventiveCare including business cards, brochures, wall posters, information on receipts, phone hold messages, Web postings, and direct encouragement from staff and providers.

The other three sites remain interested in fielding the system but were waiting to have MyPreventiveCare integrated into their EMR. As part of the programming process, the study team learned that they needed to integrate MyPreventiveCare directly into the EMR database rather than utilize the EMR’s Web services, which were incomplete. Although this uses similar patient data, the health system’s compliance office wanted to reassess the privacy and confidentiality risks associated with this revised integration. Once the health system approves this process, the project will be able to complete integration and the study sites will be able to offer MyPreventiveCare to their patients.

Project staff is preparing to collect the seven months of baseline preventive care delivery data from the study sites in order to calculate preimplementation data. This information will be used to: 1) understand the effect of the implementation process of MyPreventiveCare and 2) provide the practices further information about prevention delivery rates to help inform and motivate them during the MyPreventiveCare implementation process.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
Health Information Technology to Support Integration of Self-Management Support in Primary Care Delivery

**Principal Investigator:** Lamer, Christopher, PharmD, B.C.P.S., M.H.S., C.D.E.  
**Organization:** Indian Health Service  
**Contract Number:** IAA 10-663F-10  
**Project Period:** June 2010 – May 2012  
**AHRQ Funding Amount:** $300,000  
**Summary Status as of:** December 2010

**Target Population:** Adults, Chronic Care*, Racial or Ethnic Minorities*: American Indian/Alaska Native

**Summary:** In 2007, the Indian Health Service (IHS) Chronic Care Initiative (CCI) began to implement strategies within the IHS to improve the health status of patients and populations affected by chronic conditions and to reduce the prevalence and impact of those conditions. Efforts focused on developing patient- and family-centered care processes that apply across multiple chronic conditions, instead of separately managing individual diseases. This work is done in the Innovations in Planned Care for the Indian Health System (IPC-IHS), a learning community collaborative. IPC-IHS is designed to close the gap between what is known through evidence and what is practiced.

Self-management support (SMS) is the care and encouragement of people with chronic conditions to help them understand their central role in managing their illness, make informed decisions about care, and engage in healthy behaviors. SMS requires collaboration between patients and care providers to share information and create an appropriate care plan. SMS is a key component of patient-centered health care and the chronic care model. This project is designed to support the improvement of the delivery of prevention and care management services through the IHS CCI.

Two questions arising from IPC work on SMS are: 1) what elements (e.g., goal setting, action planning, followup), can be integrated into the electronic health record (EHR) to help prompt and document SMS within a newly-designed model of care; and 2) what key measure(s) should be collected from the EHR to drive performance improvement? This 2-year project will help answer these questions and to understand, develop, and test EHR elements that improve the delivery, documentation, and tracking of SMS services in the IPC Care Model.

**Project Objectives:**

- Develop and test electronic integration of clinical decision support and tracking into the IHS electronic health record system. **(Ongoing)**
- Implement electronic support for clinical decision and tracking for SMS services. **(Upcoming)**
- Publish a manuscript describing the work of IHS to improve the provision of primary care services as it relates to this work and IPC. **(Upcoming)**

**2010 Activities:** Prior to developing a patient goal setting component for the Resource and Patient Management System (RPMS) EHR, a careful analysis of current documentation data elements and desired data fields was conducted among numerous stakeholders. Requirements were gathered and integrated into a prototype that was refined over the course of months until all stakeholders reached an
agreement on design, both in terms of the process for documenting and viewing patient goals, as well as the appropriate data fields that would be used to document this information. The goal-setting component has entered the development lifecycle; however, the intrusion of EHR certification to achieve meaningful use has delayed development and release. The component is currently scheduled for release in May 2011.

In addition to EHR development, the IHS has begun developing a personal health record (PHR) to provide patients with access to their medical record information in the RPMS. Currently, data is unidirectional, allowing patients to view their medications list, allergies, problem list, and recent labs. Development of a bidirectional data exchange, utilizing the patient goals component, is under investigation. The PHR team will develop a technical and clinical process to allow patients to enter their goals into their RPMS medical record via the PHR. This information will be flagged as patient-entered data and a notification system for the patient’s designated clinician will be enabled to promote prompt followup, support, and refinement of the patient’s goals in order to facilitate an achievable and positive outcome.

**Preliminary Impact and Findings:** This project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Design of a Toolkit to Add Electronic Clinical Data to Statewide Hospital Administrative Claims Data

**Principal Investigator:** Levit, Katharine  
**Organization:** Thomson Reuters Healthcare, Inc.  
**Contract Number:** 290-2006-0009C  
**Project Period:** September 2009 – July 2010  
**AHRQ Funding Amount:** $50,000  
**Summary Status as of:** July 2010, Completion of Contract

**Target Population:** Not Applicable

**Summary:** As health care reform efforts increase, so does the importance of reliable and structured data streams for hospitals that are targeting quality improvements and consumers who are making health care decisions. Adding clinical data, especially “present-on-admission” (POA) codes and laboratory results, to existing administrative datasets is a practical, effective, and cost-efficient method to improve the accuracy and content of hospital-quality assessments and provide quality improvement evidence.

Based on pilot projects sponsored by the Agency for Healthcare Research and Quality (AHRQ) in four Healthcare Cost and Utilization Project (HCUP) Partner States (Florida, Minnesota, Virginia, and Washington), this project designed a toolkit to allow statewide data organizations to enhance their administrative data’s clinical content.

Based on this input and review of materials developed by the AHRQ-funded pilots, recommendations were developed on the content and dissemination strategy for the toolkit. Recommendations included designing a toolkit of the materials developed by the pilot States and other HCUP partners, and developing new benchmarking tools to evaluate the quality of POA results. Toolkit information is disseminated through the HCUP User Support (HCUP-US) Web site, educational Webinars with HCUP partners and others, presentations at professional conferences, and a journal article to document the purpose, process, and results of working with data organizations to expand clinical data collection.

Additional information about this project is available through the Enhancing Clinical Data Web site, and the toolkit design report.

**Project Objectives:**

- Catalog tools that help data organizations increase effectiveness and efficiency when adding laboratory values or POA codes to administrative discharge records. **(Achieved)**
- Solicit input from partner organizations and statewide data organizations on ways an electronic toolkit can enhance the clinical content of statewide electronic hospital discharge abstracts. **(Achieved)**
- Develop content recommendations for an Adding Clinical Data toolkit. **(Achieved)**
- Develop a toolkit dissemination strategy. **(Achieved)**

**2010 Activities:** In February, an online survey collected information about POA data and lab values to assess partner interest and current activities in enhancing the clinical content of administrative data. This survey was also designed to help AHRQ determine what tools would be most useful for collecting
clinical information. Twenty-seven individuals from 25 of 42 HCUP Partner States responded to the survey, for a 60 percent response rate.

Statewide data organizations participating in the HCUP provided input on useful materials and examples to include in a toolkit. For additional suggestions, two Webinars about adding clinical data were conducted in early 2010. During these events, partners discussed the types of tools for adding POA and/or lab values to administrative records for inclusion in the Adding Clinical Data Toolkit, and the biggest challenges to adding this data. Statewide data organizations also expressed uncertainty about the quality of POA codes collected.

Feedback included requests for technical information on increasing POA coding accuracy and programming code for POA screening to identify potential coding errors. Suggestions for lab data included information on establishing a business case for collection, identifying the most useful lab tests and timing relative to admission for collection, using lab coding standards, and assessing data quality.

**Impact and Findings:** The project’s final report made specific recommendations for the Adding Clinical Data Toolkit based on information collected by the planning and pilot contracts, the partner survey, and the Webinar discussion. Recommendations included addressing all facets of data collection, redesigning the HCUP-US Enhancing the Clinical Content of Administrative Data Webpage to incorporate the toolkit, and in turn populating the toolkit with specific items from that Web page, and suggestions for toolkit dissemination.

The toolkit comprises two sections: POA and lab values. Although similar in structure, the POA section focuses more on training and results because most partners are familiar with collecting POA. The lab values section assumes that partners have little knowledge about this area and will need extensive information on the importance (business case) for collecting lab values, standardized coding and data transmission and storage issues, lab value collection options, and hospital readiness and training issues.

The final report also describes the challenges faced by the partner data organizations as they expanded the clinical data available on their administrative databases, and presents findings on potential useful tools. The resulting recommendations for building an electronic toolkit will help other partners enhance the clinical content of their statewide electronic hospital discharge abstracts. The tools will also support the entire life cycle of the project to add laboratory results, and will further efforts to improve the quality of POA coding and analysis of results.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
Enabling Health Care Decisionmaking Through the Use of Health Information Technology

**Principal Investigator:** Lobach, David, M.D., Ph.D., M.S.
**Organization:** Duke University
**Contract Number:** 290-07-10066-I
**Project Period:** September 2009 – February 2011, Including No Cost Extension
**AHRQ Funding Amount:** $405,000
**Summary Status as of:** December 2010

**Target Population:** Not Applicable

**Summary:** Access to and utilization of knowledge, information, and clinical data via health information technology (IT) can facilitate clinical decisionmaking and communication. While the use of clinical decision support systems (CDSS) has the potential to make evidence-based practice guidelines available to clinicians at the point of care, there is uncertainty and concern about workflow disruption, usability in practice, and utility of the content.

In 2009, Duke University’s Evidence-based Practice Center (EPC) was awarded a contract to develop a synthesis report summarizing the evidence on the use and effectiveness of CDSS across clinical settings. The report is part of a three-report series on the Agency for Healthcare Research and Quality’s (AHRQ’s) Health IT Portfolio’s strategic goals. The report focuses on the portfolio’s goal of facilitating health care decisionmaking with health IT. As part of the work, the EPC convened a technical expert panel to conduct a comprehensive systematic literature search, review and analyze the existing evidence, and identify gaps in knowledge. The final product will be a report that synthesizes key knowledge gaps and existing peer-reviewed research to provide critical information on developing and using electronic knowledge management, defined as any electronic system based on the distillation of primary literature used at the point-of-care to inform decisionmaking, and CDSS.

**Project Objectives:**
- Identity what evidence-based study designs can be used to determine the effectiveness of CDSS. *(Achieved)*
- Identify what contextual factors and features influence the implementation and use of electronic knowledge management and CDSS. *(Achieved)*
- Identify the impact of introducing electronic knowledge management and CDSS. *(Achieved)*
- Identify what generalizable knowledge can be integrated into electronic knowledge management and CDSS to improve health care quality. *(Achieved)*

**2010 Activities:** The project team completed the literature search and the subsequent review and analysis of the existing evidence. The literature search identified 13,752 articles from which 131 randomized control trials (RCTs) were selected for inclusion. These RCTs comprised 49 percent of the comparative studies on CDSS or electronic knowledge management. The project team determined that both commercially and locally developed CDSS deployed in many venues effectively improve process measures related to performing preventive services, ordering clinical studies, and prescribing therapies. Of the 14 CDSS
features assessed in this review, the meta-analyses identified several new factors and features that were correlated with the success of CDSS across all endpoints: integration with charting or order entry system to support workflow, promotion of action rather than inaction, elimination of additional clinician data entry, and local user involvement in the development process. Three previously identified successful features of CDSS were also confirmed. The project team identified only 25 RCTs assessing the impact of CDSS on clinical outcomes, 20 assessing costs, and two assessing electronic knowledge management on any outcomes.

The results were synthesized in a draft report that was submitted and posted for public review in December 2010. The final report is planned for March 2011.

**Preliminary Impact and Findings:** Strong evidence now shows that CDSS are effective in improving process measures across diverse academic and nonacademic settings using both commercially and locally developed systems. Evidence for the effectiveness of CDSS on clinical outcomes and costs and electronic knowledge management on any outcomes is minimal, and more studies are needed in these areas. Four features of CDSS that correlate with a successful impact of clinical decision support were newly identified, and three previously identified successful features were confirmed.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
**Project Summaries**

**Improvements and Upgrades to the Electronic Preventive Services Selector**

**Principal Investigator:** McCormack, Lauren  
**Organization:** Research Triangle Institute  
**Contract Number:** 290-09-00021I  
**Project Period:** March 2010 – March 2012  
**AHRQ Funding Amount:** $479,032  
**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** In October 2006, the Agency for Healthcare Research and Quality introduced the Electronic Preventive Services Selector (ePSS), an interactive tool that provides real-time decision support for clinicians as they select the proper preventive services for their patients. The software cross-references patient characteristics including age, sex, and selected behavioral risk factors against 110 U.S. Preventive Services Task Force (USPSTF) recommendations covering 59 preventive services topics. The search results rendered at the point-of-care provide a summary of individual patient-specific recommendations, including screening tests, counseling topics, and information on preventive medications. The ePSS was launched initially for use as a Web-based resource available for download to mobile devices using the Palm and Windows Mobile computing platforms. In response to the prevalence of handheld devices in clinical care, subsequent updates to the tool made ePSS available for BlackBerry devices, iPods, and iPhones.

This project will refine and expand the content and functionalities of the ePSS tool. It provides an opportunity to improve the critical content of the system, particularly in helping providers better engage their patients in discussions of preference-sensitive recommendations and in developing tools and resources requested by health care providers.

A range of formative research methodologies are being used. These include interviews with clinicians, ethnographic observation of clinicians using the tool with patients, and a user survey on facilitators and barriers to ePSS tool use in clinical settings, as well as users’ enhancement preferences. Content will be assessed in light of two objectives: 1) ability to enhance clinicians’ communication with patients about USPSTF recommendations; and 2) ability to increase clinicians’ awareness, understanding, and consideration of USPSTF recommendations. Subsequent phases of the project will include development of a strategy for integrating the updated content into the ePSS to ensure a seamless and functional product.

**Project Objectives:**

- Identify and engage a technical expert panel to provide feedback in the research design, findings from the analysis, and final recommendations. (Ongoing)
- Conduct formative research with tool users to understand barrier and facilitators to use as well as preferences for enhancements. (Achieved)
- Identify, develop, and prioritize a subset of recommendations for new ePSS content. (Upcoming)
2010 Activities: Because the project kicked off in March 2010, the focus of activity was on project initiation, finalizing the timeline and work plan, identifying and engaging with the technical expert panel (TEP), developing the formative research plan and tools, and beginning to identify and confirm the participants in the interview and observation process. A total of nine people, including physicians and other clinicians, health researchers, and a computer interface expert, were invited to participate in the TEP. The first TEP call was conducted in August 2010, during which members provided feedback on the research plan and how the project team could increase the use of the ePSS system and integrate the USPSTF guidelines into practice. The feedback from the discussions with TEP members identified many valuable issues and concepts, some of which led to a slight shift in focus for the interview and observation process while maintaining the original scope and overall methodology of the project. Recruitment for the observational sites for the formative research resulted in the selection of nine participants; two in the Washington D.C. metropolitan area, four in North Carolina, and three in Tennessee. Separately, key informant interviews were conducted at the end of 2010 to help gain a broader view of use of the ePSS system. Analysis from the observations and interviews will be completed in 2011.

Preliminary Impact and Findings: There are no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Knowledge Creation
Use of Dense Display of Data and Information Design Principles in Primary Care Healthcare Information Technology Systems

Principal Investigator: McDonnell, Cheryl J., Ph.D.
Organization: James Bell Associates
Contract Number: 290-07-10073-1
Project Period: May 2008 – May 2010
AHRQ Funding Amount: $249,955
Summary Status as of: May 2010, Conclusion of Contract

Target Population: Not Applicable

Summary: Recent articles in peer-reviewed and popular literature have identified usability and information design shortcomings as reasons for the poor adoption of electronic health records (EHRs) and for creating new categories of errors in care delivery. Yet the usability of EHR systems, while recognized as critical for successful adoption and meaningful use, has not historically received the same level of attention as software features, functions, and technical requirements (e.g., interoperability specifications). Although the Certification Commission for Health Information Technology (CCHIT) formed a Usability Workgroup, CCHIT criteria do not assess EHR product usability. As a result, little systematic evidence has been gathered on the usability of EHRs in practices and how their design affects cognitive task flow, continuity of care, and efficiency. Further, the role of EHRs in patient care is evolving significantly as adoption is incentivized, health information exchanges are activated, and new forms of comparative evaluations are codified and made available for clinical decision support.

Given the significant Federal investment in EHR adoption, promoting improvements in EHR usability through deliberations, action-based research, and policy recommendations are timely activities for the Agency for Healthcare Research and Quality (AHRQ). This project established a foundation and action agenda for the use of dense data display and other innovative information design principles in primary care health information technology (IT) applications.

Project Objectives:

• Establish a foundation and an action agenda in the areas of dense display of data and information design to provide insights into designing better primary care electronic EHRs. (Achieved)
• Complete a detailed background report containing a comprehensive summary of the literature to serve as the basis for the final report. (Achieved)
• Conduct an innovation meeting with a group of experts in diverse areas related to the EHR and its design. The innovation group will define an ideal user interface for a primary care physician. This involves indicating how EHRs are and are not being used optimally. Additional considerations include patient safety and risk, efficiency, and the impact of having scattered information. (Achieved)
• Compile a set of recommendations on principles and policy and a research agenda. (Achieved)
• Compile a set of “use cases.” (Achieved)
• Complete a final report that integrates the background report and the output from the innovation meeting. (Achieved)
• Interview a wide array of providers of ambulatory EHR products and develop recommendations to assess and improve the state of usability in EHR systems. *(Achieved)*

**2010 Activities:** Findings from the multidisciplinary panel and interviews with EHR vendors relevant for the final project deliverable were written and published in May 2010.

**Impact and Findings:**

The Technical Expert Panel resulted in several recommendations, including:

**Research-related recommendations**

• Document patterns of clinician information use in EHR systems.
• Develop and evaluate use cases and tools for evaluating EHR implementations for adherence to usability principles and best practices.
• Develop an understanding of and ways to measure the impact of usability and information design on ergonomic (navigating, documenting) and cognitive (reading, thinking, deciding) workload, data awareness and comprehension, patient safety, clinician decisionmaking, and efficiency of care delivery.
• Understand the effectiveness of adaptive displays, defined as those data displays that change the nature or format of information presentations in light of specific patient characteristics or physician preferences.
• Assess current vendor and health care organization practices regarding information design in EHR product development lifecycle and implementation.
• Identify and evaluate existing evidence-based style sheets and guidelines for EHRs.
• Identify and evaluate innovative ways to display complex information in EHRs.
• Identify best practices in the use of shared (patient-clinician) EHR views, including applicable privacy and confidentiality issues.
• Promote fellowships in the area of EHR usability and information design.

**Policy-related recommendations**

• Establish certification requirements for EHRs based on practical and fair usability criteria.
• Develop a national EHR usability laboratory to: 1) support public-private collaboration and sharing of best practices in this area, 2) develop tools and processes to support evaluation of products and implementations, and 3) assist health IT vendors in product development and health care organizations in effective implementation of EHRs.

In addition, the panel characterized the evolving role of four primary functions of the EHR in supporting clinical practice:

• Memory aid: Reducing the need to rely on memory alone for information required to complete a task.
• Computational aid: Reducing the need to mentally group, compare, or analyze information.
• Decision support aid: Enhancing the ability to integrate information from multiple sources to make evidence-based decisions.
• Collaboration aid: Enhancing the ability to communicate information and findings to other providers and patients.
Based on feedback from EHR vendor interviews, the project expert panel made the following recommendations:

- Encourage vendors to address key shortcomings in current processes and practices related to the usability of their products. Most critical are inadequate adherence to formal user-design processes and a lack of diversity in end users during testing and evaluation.
- Include variety of end users in the design and testing process and collect their feedback throughout the product life cycle. Potentially undersampled populations include people from nonacademic backgrounds with limited health IT experience and people with disabilities.
- Support an independent body for vendor collaboration and development of standards to overcome market forces that discourage collaboration, best practices, and harmonization.
- Develop standards and best practices for customization during EHR deployment.
- Encourage formal usability testing early in design and development as a best practice and discourage dependence on postdeployment review supporting usability assessments.
- Support research and development of qualitative and quantitative tools to evaluate and report EHR ease of learning, effectiveness, and satisfaction.
- Increase research and development of best practices to support patient safety designs.
- Design certification programs that focus on objective and important aspects of system usability.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
Enabling Medication Management Through Utilization of Health Information Technology

**Principal Investigator:** McKibbon, Ann, M.L.S., Ph.D.

**Organization:** McMaster University

**Contract Number:** 290-07-100601-5

**Project Period:** June 2009 – February 2011

**AHRQ Funding Amount:** $415,975

**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** McMaster University has produced the third evidence report in the series of reports on the strategic goals of the Agency for Healthcare Research and Quality’s (AHRQ’s) health information technology (IT) Portfolio. The report focuses on improving medication management through health IT applications. Because of the diversity of health IT applications being developed and the different ways that impact can be measured, the review includes peer-reviewed scientific literature, conference proceedings, and grey literature. Many health IT applications are considered in the report, including e-prescribing applications, computerized provider order entry, clinical decision support, bar-coded medication administration, pharmacy-based health IT applications, electronic medication administration records, and other IT-based medication management tools.

The report synthesizes the evidence on health IT use and medication management to understand health IT’s impact and set future direction for the field. Medication management involves many actors and interactions, starting with the prescribing or ordering of medications by clinicians, interactions between clinicians and pharmacists to perfect the pharmacists’ dispensing of medications, administering of the medications, and the clinical monitoring of the effects of the medications. The report also assesses the use of health IT for medication reconciliation and for educational activities. Studying the integration and utilization of medication management and IT systems will lead to a better understanding of how health IT improves, or could improve, the quality and safety of medication management and other issues related to sustainability, usefulness of feature sets, and communication.

**Project Objective:**
- Summarize evidence on the extent to which health IT enables improved quality and safety in the medication management phases, which include but are not limited to: 1) accurate and timely prescribing of medication in response to a specific patient, 2) correct first-fill and refill dispensing of medications, 3) appropriate administering of medication, and 4) patients’ taking of the pharmaceutical treatment regimen as prescribed. **(Achieved)**

**2010 Activities:** Activity in 2010 focused on completing the report. This included updating database searches in June using MEDLINE, Cochrane Database of Systematic Reviews, Excerpta Medica Database/EMBASE, Cumulative Index to Nursing and Allied Health Literature, and PsycInfo. Research staff extracted data from selected articles to produce summary evidence tables with key data and important findings. A draft of the report was sent for peer review in July. The document was revised based on
the feedback of peer reviewers and AHRQ staff. A final version was submitted in December 2010 and is now available on the AHRQ National Resource Center for Health IT Web site: “Enabling Medication Management Through Health Information Technology”.

**Preliminary Impact and Findings:** The literature search retrieved 40,582 articles which were screened using titles and abstracts. From a full-text screen of 4,356 articles, 428 articles were summarized in the report. Another 361 articles on topic but with limited data were included in a bibliography.

Evidence for evaluating medication management health IT (MMIT) is strong for prescribing and monitoring (Table 1), especially for hospitals and primary care settings (Table 2). The evidence from these studies indicates process improvements, often measured as improvements in medication orders during the prescribing and monitoring phases. The bulk of this evidence of improvement is shown in studies set in hospitals. Improvements in use, knowledge, skills, and attitudes were also found to be associated with MMIT systems. These cumulated changes can, but may not always, lead to efficiency and cost gains. In contrast, little work has been done on other phases of medication management that use integrated health IT. Some IT applications used in dispensing and administering are stand-alone technologies and, by definition, are not included in this report.

Little evidence was found of significant improvement in clinical outcomes with MMIT. Possible reasons include the small number of events, the outcomes being far removed from the application of the technology, and that the clinical aspects were often not the studies’ main endpoints. It is not known whether MMIT applications are clinical- or even cost-effective because of a lack of sound economic data. User groups (e.g., nurses and pharmacists) evaluate systems and features differently and have needs and preferences that sometimes are in conflict with other groups of health professionals. The qualitative literature highlighted positive and negative perceptions and differing levels of satisfaction with the integrated health IT applications, supporting the importance of carefully assessing the effects of the health IT on workflow and the working relationships of the users.

Table 1. Research Design Across the Phases of Medication Management and Education and Reconciliation. Note that some studies cross more than one phase.

<table>
<thead>
<tr>
<th>Design</th>
<th>Prescribing</th>
<th>Order Communication</th>
<th>Dispensing</th>
<th>Administering</th>
<th>Monitoring</th>
<th>Education</th>
<th>Reconciliation/Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>RCT</td>
<td>69</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>37</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Cohort</td>
<td>13</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Observational</td>
<td>144</td>
<td>18</td>
<td>10</td>
<td>26</td>
<td>29</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Qualitative</td>
<td>37</td>
<td>5</td>
<td>3</td>
<td>10</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>263</td>
<td>26</td>
<td>17</td>
<td>39</td>
<td>77</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

RCT = randomized controlled trial.
Table 2. Settings for the Phases of Medication Management and Reconciliation and Education. Note that some studies cross more than one phase or setting.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Number of Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Prescribing</td>
</tr>
<tr>
<td>Ambulatory care (e.g., clinic, doctors office)</td>
<td>94</td>
</tr>
<tr>
<td>Community (e.g., school, community centre)</td>
<td>0</td>
</tr>
<tr>
<td>Home</td>
<td>2</td>
</tr>
<tr>
<td>Hospital</td>
<td>164</td>
</tr>
<tr>
<td>Long-term care</td>
<td>4</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>11</td>
</tr>
</tbody>
</table>

A number of areas of study are poorly addressed in the literature, most notably order communication, dispensing, administration, reconciliation, and education. Inpatient care is the most studied setting, followed by ambulatory care, whereas few studies assessed long-term care and pharmacies, especially those outside hospitals. Regarding technology, most of the studies evaluated computerized decision support systems or computerized provider order entry systems, but other MMIT applications were not often evaluated. The report identified gaps in the evidence of the effects of MMIT applications in the domain of patient and informal caregiver access to MMIT applications. These gaps are especially true for applications that are integrated with existing clinical applications, such as electronic medical and personal health record systems. A patient-centered focus for MMITs promises a new and exciting domain of study. One other important gap is in the assessment of MMIT tools that are used by non-physicians.

Most of the studies in this evidence report are quantitative observational assessments, often using historical controls. Randomized controlled trials and other methodologies with controlled populations and multi-centered demonstration studies are lacking. Those that exist often have inadequate details or weak methods, which result in only incremental additions to the evidence base for the use of MMIT. Sustainability studies, strengthened study methods, fuller descriptions of MMIT applications and settings, and reporting standards are still needed.

The value of MMIT systems needs to be assessed across financial, clinical, and organizational components. The values proposition for each stakeholder will be different based on his or her value set. Individual and group values have not been well studied. For example, what is important to nurses and pharmacists may
not be viewed similarly by physicians or patients. Although some evidence suggests positive financial and organizational gains, these gains are not universal and depend on the technology, the setting, and the impact on the stakeholders using them. Clinical benefit is not assessed well in the literature. What evidence exists seems to indicate no or very small clinical benefit from MMIT applications. Rigorous studies are needed to truly assess economic and other values.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

**Business Goal:** Synthesis and Dissemination
Using Health Information Technology to Improve Health Care Quality in Primary Care Practices and in Transitions between Care Settings

Principal Investigator: Mold, James, M.D., M.P.H.
Organization: University of Oklahoma Health Science Center
Contract Number: 290-07-10009-5
Project Period: September 2009 – September 2012, Including No-Cost Extension
AHRQ Funding Amount: $332,000
Summary Status as of: December 2010

Target Population: Not Applicable

Summary: A fundamental feature of a national health care network is the ability to share electronic health records (EHRs) from local health information exchange (HIE) hubs through regional health information organizations (RHIOs). A major barrier to RHIO use, however, is the lack of a convincing value proposition for providers. While there appears to be a net societal benefit from investments in sharing information among health care organizations, the return on investment for individual medical practices—especially smaller practices—is less certain. Medical practices incur most of the costs of adopting new information sharing technology, while health insurers and patients receive most of the benefits. Apart from capital expenses and fees, medical practices must adapt their workflow to benefit from RHIO technology. Many medical practices lack managers with the necessary implementation skills and experience. Little research has been done to determine the specific features of existing RHIOs that are most useful in primary care, what new features are needed, and how these features can be incorporated into primary care work flow and care processes.

This project documents, studies, and reports on the engagement of six primary care practices that use EHRs and are linked through a local HIE hub in a RHIO called Secure Medical Records Transfer Network (SMRTNET). SMRTNET provides access to a broad range of information—including hospital records, laboratory tests, pharmacy records, and a statewide immunization registry—from a variety of sources. As part of this project, SMRTNET will be enhanced with the Web-based Preventive Services Reminder System (PSRS), a comprehensive clinical tool for improving the delivery of patient-centered preventive services through a patient registry, prompt/reminder functionality, clinical decision support, and quality improvement (audit) functions that are accessible through a simple, secure Web interface.

The project tests the usefulness and acceptability of a RHIO’s ability to promote HIE across both local and statewide health care systems as a single point of attachment (i.e., a single interface rather than separate interfaces for multiple EHR systems) for a software application – the PSRS. While many aspects of this HIE infrastructure development are specific to the two systems being studied, the research team believes that this type of connection between HIE systems and RHIOs is likely to be implemented around the United States. Analysis of the results of this implementation will yield generalizable and useful knowledge about best practices for HIE facilitation of patient-centered care in primary care provider settings. Furthermore, the research team anticipates that Federal incentives, funding, penalties, and requirements under the American Recovery and Reinvestment Act of 2009’s “meaningful use” standards will accelerate the combined use of EHRs and RHIOs.
Based on observations and data analysis, the study team will produce an implementation guide to disseminate this type of health information technology system to other practices, at least one published manuscript reporting their findings, and a final report. The plan for disseminating the technology to primary care practices will be developed in collaboration with the Agency for Healthcare Research and Quality (AHRQ).

**Project Objectives:**

- Enhance the current features of SMRTNET by including the PSRS software program. *(Achieved)*
- Test the usefulness and acceptability of the technology intervention. *(Ongoing)*
- Develop an implementation guide that provides the principles and steps required to implement connections between such systems and documents potential benefits from and barriers to implementation. *(Upcoming)*

**2010 Activities:** Study team members visited the participating practices, interviewed practice members, administered the Practice Workflow Interview and Observation Instrument, and conducted workflow observations. Reports on laboratory test use, immunization delivery, and preventive service delivery were developed using the eClinicalWorks reporting module. An Access database was developed to collect time-motion based observation data of clinical workflows of specialists using an EHR; it was used to capture data during direct observation of physicians and nurses at site visits to participating practices. Practice-based pre-implementation data collection was completed, with the exception of time-motion based observation data.

The team worked with their AHRQ project officer to develop a dissemination and implementation plan based on goals of the project and using examples provided by previous projects. A draft of the plan was submitted for comment to the project officer. Significant delays in developing project software have postponed deployment.

**Preliminary Impact and Findings:** The project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation
Understanding Development Methods from Other Industries to Improve the Design of Consumer Health Information Technology

**Principal Investigator:** Montague, Enid, Ph.D.

**Organization:** Westat

**Contract Number:** 290-09-00023I-10

**Project Period:** September 2010 – September 2012

**AHRQ Funding Amount:** $409,388

**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** Consumer health information technology (IT) products, such as those designed for information seeking, retrieval, storage, archiving, and health monitoring, can enhance the quality of health care by empowering consumers to play a more effective, collaborative role in their own care. However, despite the potential power of consumer health IT, health care consumers have been less eager to adopt technology than consumers in other industries. According to the literature, one potential reason for the slow adoption of consumer health IT products is simply the lack of robust commercially available tools that recognize the complexity and diversity of personal health information management (PHIM) practices. PHIM practices are influenced by a variety of user and contextual factors, including demographics, attitudes, the user’s goals and objectives, and the range of tasks that the user wants to perform.

A project team of staff from Westat’s Center for Health IT, the University of Wisconsin-Madison, and the Center for Health Information and Decision Systems at the University of Maryland will build upon an earlier Agency for Healthcare Research and Quality-funded project, Personal Health Information Management and the Design of Consumer Health Information Technology. The current project will strive to identify methods to develop better-conceived and more widely used consumer health IT. To that end, the team will conduct an environmental scan and literature review to locate research, tools, methods, opinions, and other material that reveal how methods of other industries could be applied to the design of consumer health IT. The project team will convene a technical expert panel (TEP), comprised of leaders in proven product development approaches and methods, to generate insights and innovative ideas related to the design of consumer health IT. Lastly, the team will interview key informants with expertise in consumer product design in other industries, to provide additional perspectives that are likely generalizable to the design of consumer health IT.

The combination of the environmental scan, literature review, TEP, and key informant interviews will provide a better understanding of development methods from other industries and will inform a set of recommendations to guide consumer health IT vendors and developers in improving the future design of consumer health IT.

**Project Objectives:**

- Convene a TEP to bring together leaders in proven product development approaches and methods to generate insights and innovative ideas that are most likely to generalize to the design of consumer health IT. *(Ongoing)*
• Conduct an environmental scan and review of relevant grey literature to locate research, tools, methods, opinions, and other material that reveal how the methods of other industries could be applied to the design of consumer health IT. (Ongoing)

• Conduct key informant interviews to solicit innovative product development approaches that are likely to generalize to the design of consumer health IT. (Upcoming)

• Develop a set of recommendations to guide consumer health IT vendors and developers in the design of health IT tools. (Upcoming)

2010 Activities: The project began September 15, 2010. The primary focus of activity during the first quarter of the project was on administrative and personnel activities in order to rapidly initiate the project. The TEP members have been identified and the first expert panel meeting was held on November 10, 2010. The environmental scan is underway. Interview tools have also begun to be developed.

Preliminary Impact and Findings: The project team has identified some products to review and characteristics to highlight. The team has also identified design methods and draft criteria to describe them.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
# Health Information Technology and Mental Health: The Way Forward

**Principal Investigator:** Mullican, Charlotte, M.P.H.  
**Organization:** Professional and Scientific Associates  
**Contract Number:** 290-09-000027U  
**Project Period:** June 2009 – October 2010  
**AHRQ Funding Amount:** $168,699  
**Summary Status as of:** October 2010, Completion of Contract

**Target Population:** Not Applicable

**Summary:** This contract will convene a workshop to develop an agenda to guide future research in and facilitate partnerships between the mental health and health information technology (IT) communities. Participants include the Agency for Healthcare Research and Quality’s (AHRQ’s) Center for Primary Care, Prevention, and Clinical Partnerships, and the National Institute of Mental Health (NIMH). The goals are to: establish what is known about the impact of health IT on improvements in mental health care interventions, coordination, fairness, and cost-effectiveness; identify gaps in knowledge; and determine infrastructure needs for under-resourced settings.

Deliverables include a white paper created by an outside technical expert panel (TEP) to inform the content of the workshop. The TEP convened at an AHRQ-facilitated meeting and the draft white paper is being revised and finalized based on input from workshop participants. The contractor will help disseminate the paper upon completion and will work closely with AHRQ and NIMH to establish a detailed marketing plan.

**Project Objective:**
- Establish what is known about the impact of health IT on improvements in mental health care interventions, coordination, fairness, and cost-effectiveness; identify gaps in knowledge; and determine infrastructure needs for under-resourced settings. *(Achieved)*

**2010 Activities:** The TEP planned and convened the workshop and held a series of followup conference calls. The draft papers written as part of the planning process will be further developed based on the content of the workshop and submitted as a journal supplement. Publication can be expected in late 2011 or early 2012.

**Preliminary Impact and Findings:** Findings will be disseminated when the journal supplement is published.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
### Stay-at-Home Influenza Toolkit

**Principal Investigator:** Nagykaldi, Zsolt, Ph.D.  
**Organization:** University of Oklahoma  
**Contract Number:** 290-07-10009-4  
**Project Period:** August 2009 – July 2010  
**AHRQ Funding Amount:** $100,000  
**Summary Status as of:** July 2010, Conclusion of Contract

**Target Population:** General

**Summary:** Every year, seasonal influenza reminds us that the threat of pandemic influenza is real. Appropriate response to seasonal influenza and preparedness for pandemic influenza are thus inherently linked to each other. To achieve preparedness in primary care practices, patient surges related to influenza must be thoroughly studied so that models and technologies to improve surge capacity can be identified, tested, and disseminated. This project built on the past developments and findings from the Influenza Self-Management Web site which was designed by researchers at the University of Oklahoma Health Sciences Center. The project team revised, enhanced, and then piloted the Web site as a toolkit for influenza self-management. The toolkit, which can be delivered to practices as a downloadable package, is designed to guide patients through self-management and self-triage techniques during an influenza outbreak.

Toolkit revisions included eliminating proprietary content, ensuring 508-compliance, increasing organizations’ capability to customize the package, and adapting the code to allow periodic content updates over the Internet. The package now contains an implementation guide with step-by-step instructions on how Web administrators can customize the toolkit using an HTML file that edits the appropriate Web pages of the package locally and according to user preferences. Customizable features include page title, organization name, contact information, an interactive map to show location of the practice, an “About Us” page, and a list of updatable links to various influenza resources. Administrators can upload the tailored package to their organization’s Web servers and can connect the home page of the toolkit to their Web sites.

**Project Objectives:**

- Refine the Stay-at-Home Influenza Toolkit to mitigate the characterization of product endorsement by eliminating references to specific products. *(Achieved)*
- Redesign the Toolkit into a downloadable Web package. *(Achieved)*
- Ensure that the materials meet the standards for Section 508 compliance. *(Achieved)*
- Write a “how-to” manual to facilitate the effective incorporation of Stay-at-Home modules into primary care physicians’ Web sites. *(Achieved)*

**2010 Activities:** Following the refinement and enhancement activities of 2009, the project team deployed and tested the Influenza Self-Management Toolkit package at four practice sites. Testing was completed between February and April at two practices from the Oklahoma Physicians Resource/Research Network (OKPRN) and two STARNet practices in Texas. The implementation process began with communication...
between study staff and participating clinicians, Web administrators, and information technology (IT) leadership. The Toolkit and instructions on how to access the implementation guide were distributed to administrators via e-mail. Following Toolkit deployment, the project team interviewed each administrator in order to elucidate barriers to implementation and obtain information about the utility of the package and implementation feasibility. The interviews and other communications with practice leadership and physicians helped to inform recommendations for future deployment of similar applications.

**Preliminary Impact and Findings:** As of the writing of this annual summary, the final report for the project is currently under revision and therefore additional detailed findings will be forthcoming. Preliminary findings indicate that all four practices successfully implemented the Influenza Self-Management Toolkit in less than 2 months. Two practices completed the implementation within 3 weeks of receiving the initial e-mail and two other practices took longer. Web administrators reported no problems in uploading the Toolkit to their organization’s Web site. Followup interviews with Web administrators revealed that two primary barriers resulted in some delay in the customization step.

- **Organization Administrative Structure.** Small medical practices often have limited access to IT resources and personnel due to financial constraints. For these reasons, their IT operations are often managed by non-IT consultants who have a limited scope of expertise, experience, and time. Such shortcomings might have a negative impact on practices’ ability to implement and customize software packages such as the Influenza Self-Management Toolkit.

- **Technology and Compatibility.** The basic architecture of the Toolkit required the use of a local client application (e.g. an executable file). This resulted in some compatibility issues between operating systems (e.g. Macintosh or Linux vs. Windows) and browsers (e.g. Firefox or Google Chrome vs. Internet Explorer).

Recommendations gleaned from this project for similar future projects include:

- The Influenza Self-Management Toolkit and similar resources could be provided to primary care stakeholders as a centralized Web service to which practices’ Web sites would link.

- Developers of installation and user manuals should consider users’ varying level of IT expertise and preferences. Commonly-accessed methods should be used whenever possible to avoid the need for individual installation instructions.

- Alternate implementation approaches may be necessary for small, mid-sized, and large practices, depending on the IT resources and expertise that are available.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, coordination of care across transitions, and electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination
Implementation and Evaluation of Standing Orders Using Health Information Technology

Principal Investigator: Nemeth, Lynne, Ph.D., R.N.
Organization: Medical University of South Carolina
Contract Number: 290-07-10015-2
Project Period: June 2008 – July 2010
AHRQ Funding Amount: $500,000
Summary Status as of: July 2010, Conclusion of Contract

Target Population: Adults, Chronic Care*, Diabetes

Summary: Preventive health maintenance services (e.g., testing for cholesterol and lipids) can monitor, slow, or halt the progression of chronic diseases such as diabetes. These services also have the potential to reduce related disability and premature deaths. Similarly, vaccinations play a central role in preventing the development of diseases in adults and children. The promotion of health maintenance services and timely, appropriate vaccination is an ongoing focus of the health care system.

Standing orders (SOs) authorize nurses and other appropriate medical staff to provide services in the doctor’s office or to order essential services (e.g., bone density scan) that may be provided elsewhere. This project implemented and examined the effectiveness of an electronic SO process to deliver appropriate services at the right time to the right patients. This is done through the use of a health maintenance template within the McKesson Practice Partner Patient Records electronic medical record (EMR), which is certified by the Certification Commission for Health Information Technology. Previous research shows that SOs increase immunizations in practices that do not use EMRs. The potential advantage of reminder systems in practices that do use EMRs may further improve preventive and chronic care measures.

The electronic SOs and the electronic SO quality-of-care measures are based on the screening recommendations of the U.S. Preventive Services Task Force, adult immunization recommendations from the Centers for Disease Control and Prevention’s Advisory Committee on Immunization Practices, and disease monitoring recommendations for persons with diabetes from the American Diabetes Association.

The lead group for this project is the Practice Partner Research Network (PPRNet), a member-driven practice-based learning and research organization. PPRNet has developed a quality improvement (QI) model called the “PPRNet-TRIP QI model.” This model uses a set of core concepts to lead practice development efforts and determine where to focus for practice QI. The research team used the model with participating practices’ staff to help with plans to implement SOs.

The outcome measures for this study include:
- Four screening measures (cholesterol, HDL-cholesterol, mammograms, and osteoporosis).
- Six adult immunization measures (tetanus, zoster, and two measures each for influenza and pneumonia).
- Five diabetes measures (HbA1c, urinary microalbumin, HDL-cholesterol, LDL-cholesterol, and triglycerides).

The project used a mixed-methods intervention to study QI. Quantitative data measures were calculated
from quarterly extracts from the EMR and qualitative data were obtained through observation and interviews at practice site visits, network meetings, e-mails, and phone correspondence. The sample included eight PPRNet primary care practices that have between two and 25 providers who had no prior involvement with PPRNet interventions and did not previously use SOs.

**Project Objectives:**

- Facilitate the initiation of an electronic SO system and its incorporation into daily workflow in eight primary care practices, identifying best methods and strategies. (Achieved)
- Determine barriers and facilitators to the uptake and sustained use of electronic SOs in these practices. (Achieved)
- Document changes in quality of care indicators and practice time management resulting from the use of electronic SOs. (Achieved)
- Disseminate findings to the rest of the research network and publish results in a peer-reviewed medical journal. (Ongoing)

**2010 Activities:** Site visits and network meetings encouraged participation and discussion about the use of SOs, including helpful or difficult aspects, if new related activities are being undertaken, and if they are working. The study team recorded many of the discussions for transcription and qualitative analyses, which were done by constant comparative method to generate new insights into practices’ perspectives on implementing the electronic SO system.

The research team used quarterly EMR data extracts to measure the presence of health maintenance templates, use of the templates, and performance on the study measures for each practice. For the final analyses of the 15 quality indicators, the median across practices was calculated at baseline and for each month of the study. Practice-level repeated measures analyses from a mixed-model approach were used to look for significant increases in these measures over time. A manuscript summarizing the SO-TRIP project has been submitted and is under review.

**Impact and Findings:** Improvements in template presence, template use, and QI performance were found for 14 measures across all practices, demonstrating that the practices applied the health maintenance templates to their EMR system. Practices increased the presentation of reminders at appropriate intervals for each patient. Median improvements ranged from six to 10 percent in screenings, eight to 17 percent in immunizations, and zero to 18 percent in diabetes measures. Larger changes in template presence were noted in testing for HDL-cholesterol, influenza vaccinations for individuals 50-plus years-of-age, and zoster vaccinations for individuals 60-plus years-of-age, indicating that reminders were not commonly used for these patients prior to the project. During the last influenza season, most practices experienced problems receiving an adequate supply of vaccines, which may explain the plateau in the trend noted in the first year.

Qualitative methods were used to determine the barriers and facilitators to the adoption and continued use of a new electronic SO system within each practice. Facilitators included establishing practice protocols, editing and activation of health maintenance templates, use of nursing note templates, and dissemination of patient update forms. Most practices with significant improvement had established policies and protocols and educated staff on the new roles. Staff embraced the project with the support of leaders and did not experience significant time burdens. Technical competence and leadership were cited as important for optimal adaptation and use of EMR reminder tools, help staff adopt new roles, and
overcome barriers. Reinforcing the system was critical: successful practices followed up on the project with staff, soliciting staff input, and posting quarterly performance reports to share successful approaches. Several practices provided trainings conducted by practice physicians to enhance staff knowledge of the system and the implementation of the SO. Many practices took an incremental approach, adopting a restricted set of measures at first and adding others when success was demonstrated. Some practices focused on a limited set of SOs throughout the project and may need more time to demonstrate substantial improvements. Barriers included staff perceptions, limited staff education and followup, EMR technical issues, reimbursement policies for some services, and patient refusal. Two of the eight practices had difficulty incorporating the SO protocol because of larger practice size and diversity (multispecialty and an internal medicine group) of clinicians.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use

* AHRQ Priority Population.
Human Factors in Home Health Care

**Principal Investigator:** O’Connell, Mary Ellen, M.M.H.S.

**Organization:** National Research Council

**Contract Number:** AHR7128

**Project Period:** September 2009 – October 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $750,000

**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** The National Research Council Committee on Human-Systems Integration has formed the Committee on the Role of Human Factors in Home Health Care, a multidisciplinary consensus panel of recognized experts. The goal of the panel is to examine a range of behavioral and human-factors issues that have arisen due to the increasing migration of medical devices, technologies, and care practices from formal health care facilities into private homes. Although relatively little has been established empirically about these challenges, it is recognized that homes are not designed for the delivery of health care, that considerable variation exists as to what constitutes a ‘home’, and that patients and their caregivers—whether professional or lay providers—are at risk for harm when it comes to administering care in a safe and reliable manner outside formal care facilities. It is the intent of this project to gain a better and fuller understanding of:

* The human-factors challenges that take into account the relevant sensory, behavioral, and cognitive capabilities of patients and caregivers.
* The nature of the care processes, procedures, and therapies occurring in the home.
* The steady migration and use of medical equipment and technologies to the home environment.
* How the design of the physical home environment can facilitate or impede the delivery of care.
* The impact of social and community environments on healthy lifestyles.

This project is being conducted in two phases. Phase One includes a workshop with the authors of nine invited papers on various human-factors aspects of home health care, from which the committee published a [Workshop Summary Report](#) in October 2010. In Phase Two, the committee continues its work using the workshop papers, along with other inputs and research, to produce a consensus report identifying and discussing major human-factors issues in home health care, with findings and recommendations for action and future research programs. The committee will also produce a brief companion designer’s guide for home health care information technology (IT), intended to help IT designers incorporate human-factors principles, methods, and knowledge as they design products and systems for use outside the formal health care environment. These publications are expected to be released in summer 2011.

**Project Objectives:**

* Produce a consensus report identifying and discussing major human-factor issues in home health care. **(Ongoing)**
* Produce a brief companion designer’s guide for home-based consumer health IT. **(Ongoing)**
2010 Activities: The committee held its fourth meeting on March 9-10, 2010, and its final meeting on June 10-11, 2010. A draft of the consensus report was written and submitted for external review in late September 2010. Comments on the draft report were received and appropriate revisions are being considered. The project team also began coordinating dissemination activities with the Agency for Healthcare Research and Quality (AHRQ) and coordinating internal publishing activities. In addition, the project team hired a consultant to develop the designer’s guide and an outline was drafted and reviewed by the project team and AHRQ. The project changed leadership twice in 2010; Mary Ellen O’Connell and Barbara Wanchisen, Deputy Director and Director of the Board on Human-Systems Integration (The Committee on Human-Systems Integration was reestablished as the Board on Human-Systems Integration in December 2010), respectively, will assume leadership of the project until the report is released. Because of the unexpected transitions in project leadership, the project was slightly delayed and has been extended through October 2011.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination
Structuring Care Recommendations for Clinical Decision Support

Principal Investigator: Osheroff, Jerry, M.D.
Organization: Thomson Reuters
Contract Number: 290-09-00022I-2
Project Period: September 2009 – June 2011
AHRQ Funding Amount: $972,665
Summary Status as of: December 2010

Target Population: General

Summary: Incorporating widely accepted, evidence-based clinical care recommendations, also known as clinical guideline narratives, into clinical decision support (CDS) systems is a key method for improving health care and health outcomes. However, the process of translating such recommendations into “if... then...” logic statements (or rules) in CDS systems is slow, inconsistent, and inefficient, with many CDS developers independently translating text-based care recommendations into computer-executable code. Structured, coded clinical logic statements that can be electronically processed can increase the speed, consistency, and efficiency of guideline implementation as CDS rules. Such logic statements will reduce redundancy related to extracting and structuring decision logic by assigning computer-interpretable codes to the elements of recommendations, such as inclusion and exclusion criteria for relevant patients and recommended treatment actions. Also, widely accepted formats and approaches for expressing the logic and variables of recommendations will help organizations that develop care recommendations write them in a way that can be more easily adapted for use as automated clinical decision support rules. These rules can be used to trigger helpful reminders to clinicians and to identify groups of patients that may benefit from particular care interventions, as indicated by evidence-based medicine.

This project involves developing structured, coded logic statements (called “eRecommendations”) for all 45 A- and B-graded recommendations of the U.S. Preventive Services Task Force (USPSTF) and up to 20 recommendations underlying clinical performance measures required to be reported to the Centers for Medicare and Medicaid Services under “meaningful use” regulations. To identify patients for whom each clinical recommendation applies and actions that should be taken, these eRecommendations will leverage standard data elements, coding systems, and value sets being developed for performance reporting under meaningful use. The eRecommendations will be available for health information technology (IT) application developers, care providers, and others to access and further process into locally useful CDS rules.

Project Objectives:

• Increase use of interventions (e.g., tests, medications, and counseling) for which evidence-based clinical recommendations indicate a clear benefit to patients. An example is routine screening for colorectal cancer in individuals between the ages of 50 and 75. (Ongoing)

• Make it easier for clinical information system suppliers (e.g., government agencies and commercial vendors) and implementers (e.g., hospitals and physician practices) to develop and implement automated clinical reminders and related CDS tools based on widely accepted care recommendations. (Ongoing)
• Produce and populate, with broad stakeholder input, an “eRecommendation” format for expressing clinical recommendations as structured, coded logic statements that are widely useful. This includes leveraging codes and structures used to express clinical performance measures in a computable format to help tighten the measurement and CDS components of the clinical performance improvement cycle. (Ongoing)

• Leverage the eRecommendation format and project learning to help clinical guideline developers make their recommendations more precise and easier to translate into automated clinical reminders. (Ongoing)

2010 Activities: The project devised, vetted, and documented a consistent method for transforming evidence-based clinical recommendations into a format that can be readily adapted further for widespread implementation in CDS systems and other health IT products. The project used the eRecommendations format to develop a collection of structured clinical recommendations for A and B grade USPSTF guideline statements, as well as a few meaningful use measures. To help ensure that the work performed was supported by the full range of stakeholder perspectives, a Rule Value Advisory Panel was convened to provide input about the value of proposed project deliverables and their potential future use. The project team specifically sought out potential users of structured recommendations who were interested in testing the usefulness of the eRecommendation template in the short term and possibly providing continuing feedback over a longer term.

In the last quarter of 2010, the project engaged in further activities to examine and enhance eRecommendation use in CDS rules. This included launching a pilot analysis of eRecommendation use in two real world settings – one inpatient (Memorial Hermann Healthcare System) and one outpatient (Tulane Community Health Centers). It also included building an “eRecommendation Stakeholder Community” consisting of a broad cross-section of potential eRecommendation developers and users and other relevant parties. This Community was formed to follow the pilot site findings in 2011 and identify next steps for supporting widespread eRecommendation use and value.

Preliminary Impact and Findings: The project team has held several key discussions with information system developers, implementers in both the public and private sector, associations that represent these stakeholders, and Federal care delivery organizations (i.e., Veterans Health Administration, Department of Defense, and Indian Health Service) to develop a report that synthesizes the background, existing approaches, and specific approach of this project for creating eRecommendations. A core strategy has been to align the format and methods for creating eRecommendations with corresponding work towards national standards and tools for integrating performance measurement and reporting into electronic health records. These include eMeasures for quality measurement, which draw on the Health Quality Measure Format and the Quality Data Model specifications from the National Quality Forum. Because of the strong motivation of information system suppliers and implementers to adopt eMeasures and related standards in order to achieve meaningful use, this alignment provides considerable synergy for CDS implementation efforts.

Multiple stakeholders validated that initial project deliverables hold promise for improving the efficiency and effectiveness with which clinical recommendations can be structured and coded for subsequent CDS rule implementation. The project has also cultivated synergies with other related national CDS initiatives that, if further developed, might help ensure widespread use of effective CDS rules. At the same time, the work to date has identified important issues that must be addressed to fully realize this promise.
Strategic Goal: Improve health care decisionmaking by developing and disseminating health IT tools that better manage the knowledge from evidence-based clinical guidelines and accepted quality measures

Business Goal: Implementation and Use
Establishing Federal Resources to Support the Patient-Centered Medical Home Concept

**Principal Investigator:** Peikes, Deborah, Ph.D., M.P.A.

**Organization:** Mathematica Policy Research, Inc.

**Contract Number:** 290-09-00019I-2

**Project Period:** September 2009 – March 2011

**AHRQ Funding Amount:** $1,249,206

**Summary Status as of:** December 2010

**Target Population:** General

**Summary:** This project supports the efforts of the Agency for Healthcare Research and Quality (AHRQ) and the Federal government to develop the evidence base on the patient-centered medical home (PCMH) for researchers and policymakers. The PCMH model is a promising strategy for transforming primary care and improving the effectiveness, efficiency, quality, and patient experience of health care. The goal of the project is to establish the foundation for a conceptual framework and communications infrastructure that will help AHRQ develop recommendations for PCMH design, implementation, and evaluation.

**Project Objectives:**

- Conduct an environmental scan that synthesizes PCMH knowledge and issues in primary care and health policy in order to help policymakers understand emerging PCMH initiatives. *(Achieved)*
- Develop white papers to fill knowledge gaps on PCMH-related topics. *(Ongoing)*
- Convene the Federal Collaborative for the Patient-Centered Medical Home to identify relevant Federal and private sector medical home initiatives and how they relate to each other. *(Ongoing)*
- Develop a strategic plan to leverage Federal leadership and activity in developing public and private sector work on PCMHs. *(Achieved)*

**2010 Activities:** This project reconvened the Federal Collaborative on the PCMH to improve coordination and collaboration among Federal agencies working on PCMH-related projects. The collaborative includes more than 172 members representing 14 agencies and departments. Members communicate through face-to-face meetings, a Federal portal that allows electronic interchange and document sharing, and a listserv that allows members to share information, ideas, articles, and announcements about events of interest.

A catalog of Federal agency activities and research related to the patient-centered medical home was developed. This resource includes a variety of information on agency efforts including implementation work, research being conducted, and partnerships with other agencies. This guide will help agencies in forming new cross-agency partnerships and will serve as a reference guide for finding Federal peers with PCMH knowledge on specific topics. One version of the guide was created specifically for Federal collaborative members; another version will be made publicly available.

This project also developed a publicly-accessible PCMH Web site (www.pcmh.ahrq.gov) for policymakers and researchers, at which foundational papers and background information from this and other projects are posted.
In response to AHRQ’s request, the project team also contributed to AHRQ’s mid-course review of their PCMH work to better reflect the emerging needs of government and private-sector stakeholders, and emerging policies from health reform in future work.

**Preliminary Impact and Findings:** The project has provided information for medical home stakeholders, including Federal and State agencies, policymakers, payers, patients, providers, and the media.

The project filled gaps in the conceptualization and understanding of key medical home concepts by working with AHRQ to develop the following outputs.

- A series of white papers on patient engagement, mental health integration, health information technology, and the medical neighborhood.
- A briefing on care coordination in the patient-centered medical home and the accountable care organization for AHRQ and for a meeting of key health care decisionmakers that was sponsored by the Patient-Centered Primary Care Collaborative.
- A series of decisionmaker briefs.
- A gathering of experts to advise the project on the conception and formulation of the white papers as well as a list of key foundational articles for decisionmakers.
- A presentation at the AHRQ annual conference on the state of current and future research needs.
- Quarterly updates to a database of citations listing the leading resources on the medical home, categorized by topic, population, bibliographical information, and keyword.
- A list of foundational articles to help decisionmakers understand the emergence of and latest thinking on the medical home.
- A definition of the medical home.
- A list of key outcome articles on the PCMH for the AHRQ PCMH Web site.
- Text for AHRQ’s public and private (Federal only) portals on PCMH.

**Strategic Goal:** Develop and disseminate research and conceptual frameworks and facilitate Federal collaboration to support patient-centered care, enhanced primary care, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination
**Patient Safety Metadata**

**Principal Investigator:** Penoza, Chuck, M.B.A.  
**Organization:** Data Consulting Group  
**Contract Number:** 290-08-10005M  
**Project Period:** January 2008 – December 2010, Completion of Contract  
**AHRQ Funding Amount:** $1,012,814  
**Summary Status as of:** December 2010

**Target Population:** Not Applicable

**Summary:** A common data classification registry streamlines the processes associated with information exchange, both within the Federal Government and between the Government and external stakeholders. Streamlined processes allow for the identification of and concentration on key improvement areas, and produce clearly identified, measurable results. The United States Health Information Knowledgebase (USHIK) is a metadata registry of health care-related data standards. This registry, which meets the requirements of the International Organization for Standardization and the International Electrotechnical Commission, has been a collaborative effort among several health information organizations and Federal agencies such as the Centers for Medicare and Medicaid Services, the Department of Defense Military Health System, the Agency for Healthcare Research and Quality (AHRQ), and the National Cancer Institute. These agencies recognize the need to maintain an Internet-based registry of data standards to be maintained long term. USHIK supports metadata registry for these several health care data initiatives and for 10 years has provided a single axis of continuity for various approved standards, elements, code sets, references, and additional artifacts at the Federal level. The USHIK registry supports these initiatives and participating Federal Government health care agencies by cataloging and providing a platform for maintaining and harmonizing standardized, approved data artifacts across multiple organizations, agencies, and entities.

The USHIK project complies with the e-Government Act of 2002 and the President’s Management Agenda to use Internet-based information technology to enhance access to Government information and resources. As reusable components are identified and agencies begin to collaborate, USHIK is the single point of continuity among initiatives, agencies, and projects. AHRQ is responsible for the metadata repository, and USHIK will provide the mechanism for storing, maintaining, and sharing these metadata components.

USHIK project staff facilitated implementation and usage of these components and component-based architectures across the health enterprise. USHIK described the types of interactions and information exchanges that occur between the Federal health communities and various customers, constituencies, and business partners. USHIK has the capacity to categorize and display the Government’s information along with specific information exchange requirements and content areas and can deconstruct those content areas into greater levels of detail, e.g., basic data components that are common to many health-related processes and activities. USHIK facilitates the sharing of information exchange requirements through standards-based, reusable, secure, portable, and interoperable technology standards. Project efforts will further establish commonly understood classifications for health data elements, identify duplicative data...
resources, and enable information sharing among agencies. AHRQ oversaw the focused data efforts to ensure that all appropriate points of integration are identified.

**Project Objectives:**
- Maintain the metadata registry. *(Ongoing)*
- Support the Healthcare Information Technology Standards Panel. *(Ongoing)*
- Support AHRQ’s Center for Quality Improvement and Patient Safety (CQuIPS). *(Ongoing)*
- Provide support for external agencies. *(Ongoing)*

**2010 Activities:** The official release of the Common Formats USHIK portal occurred in April 2010. This allowed the USHIK community, including researchers, systems developers, policymakers, clinicians, and the general public, access to the Common Formats metadata in USHIK. The release of this portal included supporting functionality comprised of a custom interactive informational model that allows users to navigate the Common Formats data. This portal was continuously improved over the course of the year based on the requirements of the CQuIPS stakeholder. Multiple demonstrations were conducted during 2010 to communicate the availability and functionality of this portal.

Specific functionality implemented in support of the Common Formats portal in USHIK during 2010 included tools to load and update Common Formats data in USHIK, capability to export Common Formats metadata from USHIK in a variety of convenient formats, and supporting online functionality including help pages and a glossary customized for the Common Formats metadata. The AHRQ USHIK team continues to provide support to the CQuIPS team as their Patient Safety initiatives evolve.

**Impact and Findings:** The project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Implementation and Use
Telemonitoring in Rural Elder Nutrition Centers: Demonstration Project of Hypertension Management

Principal Investigator: Resnick, Helaine, Ph.D.
Organization: LeadingAge (formerly known as American Association of Homes and Services for the Aged)
Contract Number: 290-06-0024-2
Project Period: July 2009 – April 2011
AHRQ Funding Amount: $399,919
Summary Status as of: December 2010

Target Population: Elderly*, Hypertension, Low SES/Low Income*, Rural Health*

Summary: With the aging of the U.S. population, increased attention is being given to delivering health and related services to older persons in the community and to how new technologies can facilitate delivery and receipt of services that were once available only in traditional ambulatory care settings. There is a vast network of organizations that provide nutrition and other health promotion, disease prevention, and social services to low-income elders, many of whom live in rural areas. Harnessing the networks and infrastructures of senior centers may be a particularly efficient means of using technology to reach many vulnerable elders.

The primary objective of the study is to evaluate the feasibility of using telehealth technology to manage blood pressure (BP) in a community setting that targets high-risk elderly patients. A secondary objective is to compare BP control in a telehealth group to a control group. The study is being conducted among hypertensive adults who receive nutrition assistance at one of four senior centers in Ohio. Two of the centers have installed telehealth kiosks that allow participants to conduct self-monitoring of their BP any time they use the center; the two sites that do not have kiosks serve as the control facilities. Data are being collected on hypertension baseline and endpoints such as physician visits and medication titrations, with a focus on comparisons between participants at intervention and control facilities.

This study will help determine whether integrating the networks and infrastructures of both federally and privately-funded senior centers is an efficient way to reach vulnerable elders. The results of this study will be the first step in determining the promise of further research in this area.

Project Objectives:

• Determine proof-of-concept for a system in which telehealth monitors can be utilized to manage BP in a community setting that targets high risk elders. (Ongoing)

• Compare BP control in a telehealth group to BP control in a control (non-telehealth) group. (Ongoing)

2010 Activities: Participant recruitment and enrollment was completed in 2010, with the last participant followup contact completed in November. In addition, data were collected from a physician survey among 11 respondents. Two interim reports were developed, in March and August 2010 respectively, on the implementation and assessment of telehealth BP stations. A paper titled, “Impact of blood pressure telemonitoring on hypertension outcomes: a literature review” was published in the Journal of Telemedicine and e-Health in September 2010. There were also multiple presentations of preliminary
findings at several national meetings in 2010, including: 1) an introduction of the project to the American Association of Homes and Services for the Aging (AASHA) 2010 Future of Aging Services Conference and Leadership Summit in Washington D.C. in February; 2) a presentation of the literature review, study design, and preliminary data to the Long Term and Post Acute Care Supportive Services conference in Baltimore, MD in May; and 3) a presentation of the literature review and lessons learned to AASHA’s Annual Meeting in Los Angeles, CA in November.

**Preliminary Impact and Findings:** During initial enrollment it became apparent that recruiting intervention participants was more difficult than anticipated. A lower-than-expected number of participants identified themselves as having hypertension, a finding that posed challenges to enrollment efforts. However, since this is a pilot study and not aimed at formal hypothesis testing, no statistical issues dealing with power are anticipated as these methodological issues are not inherent to the study design. An additional observation made was unreliable Internet connectivity at one of the intervention sites, a finding that has important implications for the broader application of this work in the future.

Observations in the earlier phases of the study point to the many preliminary findings, including:

- Challenges exist in obtaining service and maintaining continuity from local Internet services providers, therefore Internet connectivity at senior centers is not always ideal. Because telehealth is predicated on reliable Internet connectivity, this issue is one that will need to be examined very carefully in the evaluation of this project.

- Proper selection of BP cuff size and proper placement of BP cuff may require extra instruction to ensure correctness and consistency. Participants may benefit from being given a reminder card with easy-to-follow instructions. This important consideration has a direct impact on BP measurement, which in turn, has implications for how individuals’ BP will be managed.

- Participants may have increased BP scores when starting to use the machine due to anxiety over use of the kiosk. Evidence that “white coat hypertension” is present in telehealth is important to consider when reviewing initial and preliminary readings from seniors who are new to this technology.

- Participants have more experience with automatic BP machines at baseline than expected with more than 99 prior uses. Even in relatively rural areas, exposure to automated BP devices at home, in pharmacies, and in supermarkets is relatively high, a factor that may help ease the transition into use of this technology in the setting of telehealth.

As of December 2010, data collection is complete and analysis is well underway. Findings from the analysis will be available in 2011.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Health Information Technology Enablement of Quality Measurement: Health Information Technology Expert Panel

Principal Investigator: Rosenthal, Daniel, M.D.
Organization: National Quality Forum
Contract Number: 290-07-10017-3
Project Period: June 2008 – June 2010
AHRQ Funding Amount: $526,927
Summary Status as of: June 2010, Completion of Contract

Target Population: General

Summary: The project built on prior work the National Quality Forum (NQF) completed under direction of the first Health Information Technology Expert Panel (HITEP-I). The earlier HITEP-I report recommended 11 data categories and 39 data types, for a set of 84 high-priority performance measures to enhance capabilities for the electronic capture of data for quality measurement. Through this project, NQF reconvened the panel (HITEP-II) to gather, synthesize, and refine clinical workflow maps, focusing on care processes related to the previously prioritized set of measures. The project consisted of two primary workgroups:

• The Quality Data Set Workgroup helped guide the development of recommendations to further quality measurement using health information technology, and used the panel’s expertise to develop materials concerning health information technology standards, capabilities, and quality measurement.

• The Workflow Workgroup defined the workflow to manage electronic health information to enable expected patient care while decreasing the information seeking and documentation burden for individual clinicians. The work product defines the qualitative and quantitative aspects of data by examining quality data flow maps. Such quality data management addresses three requirements for data: the authoritative source, the methods for attribution of accountability at the source of the data, and the method of transit.

Project Objectives:

• Represent quality data requirements (concepts, data types, data elements, and code sets) unambiguously and specifically. (Achieved)

• Determine mechanisms and opportunities within quality data management workflows for identifying patients who are eligible for inclusion in measure populations, gathering performance measurement data, and providing clinical decision support to optimize performance in targeted areas. (Achieved)

2010 Activities: The project objectives listed above were completed in 2009, ahead of schedule. The final report, titled Health Information Technology Automation of Quality Measurement: Quality Data Set and Data Flow and the HITEP II policy brief have since been published.

Impact and Findings: A draft quality data set (QDS) was developed that could be used nationwide to support automated quality measurement. The QDS framework contains three levels of information: standard elements, quality data elements, and data flow attributes. The QDS is a classification system by which measure developers can offer and refine definitions. Once fully developed, the QDS would be a
centralized repository of quality data requirements (such as concepts, data types, data elements, and code lists) and data definitions used by multiple stakeholders to develop, specify, and use quality measures. The QDS aims to provide direction to measure developers, electronic health record vendors, and other stakeholders on how to define quality terminology without ambiguity.

The QDS framework is also intended to represent clinical and administrative information required to calculate quality measures. These elements will be used to construct, with measure-related logic, numerators and denominators. Because of the importance of the QDS as a framework from which electronic health record developers can extract data for performance measurement, adherence to the QDS will likely become a requirement for NQF endorsement.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
Improving Guideline Development and Implementation

Principal Investigator: Shiffman, Richard N., M.D., M.C.I.S.
Organization: Yale University
Contract Number: 09-587F-07
Project Period: September 2006 – September 2011, Including No-Cost Extension
AHRQ Funding Amount: $133,000
Summary Status as of: December 2010

Target Population: General

Summary: Over the past 15 years, a major global initiative has been undertaken to develop, disseminate, and implement clinical practice guidelines. However, in a process as complex as translation of medical knowledge into systems that influence clinical behavior, a number of shortcomings have been identified, including problems in the authoring process, quality defects in the production of guidelines, and obstacles to effective implementation. Although systematic reviews have demonstrated that computerized systems can be effective in implementing guidelines in clinical practice, creating computer-mediated guideline implementation systems has also proven to be onerous and not uniformly successful.

Yale University has designed a research program, co-funded by the National Library of Medicine and the Agency for Healthcare Research and Quality, on the Effective Representation of Guidelines using Ontology. This study is intended to reduce guideline ambiguities, improve efficiency, and create and evaluate tools that promote the writing of comprehensive and implementable guidelines. Overall, this program helps researchers gain an understanding of how to improve knowledge acquisition, and helps guideline authors to state recommendations precisely and comprehensively in a manner that remediates ambiguity and facilitates implementation.

Project Objectives:

• Create a library of representative guideline recommendation statements that will be used to better understand and characterize the current corpus of guideline statements and to serve as a resource for modeling and evaluation activities. (Achieved)
• Delineate the range of ambiguous, vague, and underspecified language in recommendation statements and devise targeted remedies. (Achieved)
• Analyze the terminology of obligation (deontic components) used in guideline recommendation statements to understand how this concept can be applied most effectively. (Achieved)
• Create ontology of recommendations. (Achieved)
• Develop and evaluate a controlled language editor for use by domain experts to facilitate authoring of recommendations that can be translated into decision support tools. (Ongoing)

2010 Activities: The first generation of Building Recommendations in a Developer’s Guideline Editor (BRIDGE-Wiz) was developed in the earlier years of this project and, to date, has been used in four guideline development efforts and with good results. BRIDGE-Wiz formalizes and systematizes a process for creating implementable guideline recommendation statements. The software continues to be evaluated and refined. The focus of activity in 2010 was on creating the ontology of recommendations and
developing and evaluating a controlled language editor that can be translated into decision-support tools. To that end, the concept of action type(s) for each guideline recommendation was applied to BRIDGE-Wiz as an organizing principle. The American Academy of Pediatrics has incorporated BRIDGE-Wiz in their standard development process. In addition, activities related to developing and evaluating a ‘what you see is what you mean’ interface are ongoing. This interface is expected to be used by domain experts to facilitate authoring of recommendations that can be translated into decision support tools to enhance the accuracy of translation and ease of implementation of new knowledge contained in guidelines.

Two project-related papers were published in 2010 and a third paper in press at the time this summary was written. Another two papers were submitted for publication in 2010. Numerous presentations, a poster, and a workshop course were also delivered at various venues.

**Preliminary Impact and Findings:** Ambiguity, vagueness, and underspecification have been demonstrated to impair the perceived value and implementability of guideline recommendations. Working with collaborators in Zurich, Switzerland, the project team translated a set of guideline recommendation statements into Attempto Controlled English (ACE). ACE texts are computer processable and can be unambiguously translated into discourse representation structures, a syntactic variant of first-order logic. The team found that ACE can be used to adequately express clinical practice guideline recommendations and ACE statements were judged to be acceptably ‘natural’-sounding. Principles identified can be used to improve the quality, clarity, and implementability of clinical practice guidelines. This represents some of the first work with controlled natural language in health care.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Knowledge Creation
Improving Electronic Health Record Patient Education Materials

**Principal Investigator:** Shoemaker, Sarah J., Pharm.D, Ph.D.
**Organization:** Abt Associates, Inc.
**Contract Number:** 290-09-00012I-4
**Project Period:** July 2010 – July 2013
**AHRQ Funding Amount:** $524,945
**Summary Status as of:** December 2010

**Target Population:** Low Literacy

**Summary:** Health literacy refers to an individual’s ability to read, understand, and use health care information to make decisions about treatment. An estimated 90 million people in the United States have limited health literacy. While advances in health information technology have the potential to improve accuracy and efficiency in health care, a low level of patient health literacy can negatively impact the communication between physician and patient, resulting in substandard care. Therefore, to successfully empower patients to actively participate in their care, health literacy must be a consideration in the design of health information or patient educational materials.

Abt Associates is leading a study to develop a rating system to assess whether patient education materials delivered by electronic health records (EHRs) are written in a way that is sufficiently understandable for patients to make relevant decisions and take action. An environmental scan will serve to compile a list of existing rating systems and potentially relevant usability scales, as well as identify relevant domains. A Technical Expert Panel (TEP) will be established as a resource for expertise and guidance into the development of the Health Information Rating System (HIRS).

**Project Objectives:**

- Develop a scale to rate the understandability and actionability of health information or patient education materials provided via EHRs. *(Ongoing)*
- Complete an environmental scan and develop an inventory of publicly available patient education materials that rate well on the new scale. *(Upcoming)*
- Review current EHR patient education capabilities and features. *(Upcoming)*
- Educate EHR vendors and users about the need for and availability of appropriate education materials. *(Upcoming)*

**2010 Activities:** In the six months between the project kick-off and the end of 2010, the focus of activities has been on drafting the Office of Management and Budget (OMB) clearance plan, developing and revising the HIRS Plan, and engaging the TEP. Planning for the review of EHR patient education capabilities has also begun. A date for the first TEP meeting is scheduled for January 2011. The revised HIRS plan includes a protocol for how best to engage the TEP at the first meeting, particularly in regards to operationalizing the domains of understandability and actionability, which will affect the design of the HIRS and most importantly, consumer testing. Once the operationalizations for the domains are finalized, the OMB protocol package can be submitted for consideration.

**Preliminary Impact and Findings:** The project has no findings to date.
Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
Improving Lab Followup by Delivering an Enhanced Medication List to Outpatient Physician Practices

**Principal Investigator:** Simonaitis, Linas, M.D., M.S.

**Organization:** Indiana University

**Contract Number:** 290-06-0013-2

**Project Period:** September 2007 – April 2010

**AHRQ Funding Amount:** $400,000

**Summary Status as of:** April 2010, Completion of Contract

**Target Population:** General

**Summary:** Medication errors and adverse drug events (ADEs) are a major problem across the United States and have serious clinical and economic consequences. Although outpatient providers could detect and prevent many of these errors, their limited time with patients, their high workloads, and the challenge of managing a large volume of dynamic information can affect their ability to do so. Providers need to know what medications their patients take now, or have previously taken, if they are to improve medication management. However, primary care providers often do not know which medications have been prescribed by other providers or which non-prescription medications the patient takes. An accurate and complete medication list, facilitated by technology, can be an effective tool to promote the quality and safety of health care.

The goal of this project is to design, develop, and evaluate a method of providing medication data from the Indiana Network for Patient Care (INPC) to ambulatory primary care practices to enhance health care quality and safety. The project team at Indiana University and the Regenstrief Institute developed the Enhanced Medication History (EMH), a medication history based on pharmacy dispensing records from three sources: RxHub commercial pharmacy benefit managers, Medicaid, and the Wishard County health services outpatient pharmacy. The EMH is supplemented by laboratory data from INPC and includes clinical decision support reminders specifically related to the patient on drug-drug interactions, drug-lab interactions, and drugs to be avoided in the elderly.

The project team modified the clinic registration system to create a trigger message when a patient registers. The trigger message is sent to the INPC to collect patient data and automatically produce a patient-specific EMH report. The report is delivered to the correct printer at the correct clinic within 1 to 2 minutes of the patient’s registration. When the report is printed, nurses or clinic staff place the document in the patient chart for the physician-patient visit.

The project team evaluated the EMH in a randomized, controlled trial, examining its impact on patient quality and safety indicators compared to usual care, as well as provider satisfaction with the EMH. Over a 46 week time period, the EMHs were successfully delivered to health care providers at two sites of a community health organization for 4,449 patients. Based on their written and verbal evaluations, the physicians considered the medication histories to be a useful tool even though the medication histories were incomplete summaries. The EMHs complemented information from chart notes and patients and helped discover previously unknown medication usage.
Project Objectives:
- Aggregate medication histories from multiple sources into a single document. (Achieved)
- Add decision support rules to medication history documents in selected areas, such as inadequate lab monitoring, drugs with abnormal labs, or drugs to avoid in the elderly. (Achieved)
- Deliver enhanced medication history documents to clinics. (Achieved)
- Examine instances of decision support rule use. (Achieved)
- Examine quality and safety improvements. (Achieved)

2010 Activities: The evaluation period ended in October 2009. The main focus of activity in 2010 was data analysis, manuscript development, and dissemination, including a poster, “Medication Histories in the Indiana Network for Patient Care: Enhanced with Decision Support Reminders and Delivered to Primary Care Clinicians” presented at the Agency for Healthcare Research and Quality Annual Health Information Technology Grantee and Contractor Meeting in June 2010 and an oral presentation at the American Medical Informatics Association Annual Symposium in November 2010, “Continuity of Care Document Enables Delivery of Medication Histories to the Primary Care Clinician.”

Impact and Findings: Although analysis did not detect any significant difference between intervention and control patients on the safety and quality measures, potentially due to an insufficient sample size based on a decision to enlarge the intervention group (80 percent of sample versus 20 percent for the control), providers found the medication histories useful, especially when the provider did not know what the patient was taking. Nine physicians were surveyed and reported the usefulness of medication histories; however, there was less agreement on the completeness of the histories. It was strongly agreed that medication histories helped discover drugs which were previously unknown and helped identify overuse of controlled substances. The entire process, from the initial arrival of the patient to the final delivery of the printed report, required less than 2 minutes with minimal disruption to clinic workflow. The process was triggered automatically by the normal activities of registering a patient. The printed documents were easily integrated into the paper-based process of assembling a clinic chart.

The project team reported several lessons for others developing similar interventions:
- Keep disruptions in clinic workflow to a minimum;
- Have a clinic liaison to identify potential problems;
- Essential data sharing organizational agreements need to be in place;
- Develop a linkage algorithm to connect patient identifiers from multiple data sources;
- Test and fine-tune the information in the patient arrival messages with the clinic management;
- Representing drug strength information is a complex task that may require improvements in external data sources and message standards;
- It is important to deliver the EMHs quickly; and,
- Until full electronic health record adoption, solutions must be flexible enough to support paper-based clinics.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve the quality and safety of medication management via the integration and utilization of medication management systems and technologies.

Business Goal: Knowledge Creation
Conducting Measurement Activities for Health Information Technology Initiative

Principal Investigator: Spranca, Mark D., Ph.D.
Contract Number: PSC 23302008, TO#HHSP23300700008T
Project Period: September 2007 – August 2010, Including No-Cost Extension
AHRQ Funding Amount: $710,000
Summary Status as of: August 2010, Completion of Contract

Target Population: General

Summary: Agency for Healthcare Research and Quality (AHRQ)-supported research has played a central role in identifying areas where health information technology (IT) might provide needed improvements in health care delivery. AHRQ’s extensive research has shown the increased need to assess the adoption, use, and outcomes of health IT.

This project identified the most appropriate and feasible methods of collecting data on national performance on the adoption, use, and outcomes of health IT in four areas: 1) reduction in medication errors due to adoption of computerized provider order entry (CPOE) systems; 2) the number of patients who can access information electronically on medication therapy; 3) the number of clinicians who can access evidence-based (EB) prevention or treatment information electronically; and 4) the number of clinician organizations that have adopted EB decision support technologies.

After clarifying constructs and assessing the availability and quality of data, selected measures were used to inform the activities of AHRQ’s Health IT Portfolio and gauge national progress toward health IT adoption goals. Additionally, based on the lessons learned from this effort, Abt Associates proposed a flexible new framework that AHRQ, the Office of the National Coordinator (ONC) for Health IT, and various foundations may use to monitor the adoption, use, and outcomes of health IT in the new landscape created by the Health Information Technology for Economic and Clinical Health Act of 2009 (HITECH).

Project Objectives:
• Develop reliable, valid, useful, timely, and cost-efficient measures and national estimates for four key measures of health IT progress:
  • Reduction in medication errors due to adoption of CPOE systems. (Achieved)
  • The number of patients who can electronically access information on medication therapy. (Retired)
  • The number of clinicians who can electronically access EB prevention or treatment information. (Achieved)
  • The number of clinician organizations that have adopted EB decision support technologies. (Achieved)

2010 Activities: Data analysis and reports were completed and a manuscript was submitted for publication to the Archives of Internal Medicine. The project team completed data analysis on the reduction in medication errors due to CPOE, the adoption and use of clinical decision support (CDS) in ambulatory care settings, and the adoption by hospitals of EB decision support technologies. The study team also analyzed the implications of the HITECH Act of 2009 on future measurements in the health IT field, as
well as the implications of new meaningful use of health IT measures proposed by the ONC and Centers for Medicare and Medicaid Services. The Office of Management and Budget (OMB) determined that developing measures or estimates for the number of patients who can electronically access information on medication therapy was outside AHRQ's scope; therefore this particular objective was retired.

Impact and Findings: The main findings are grouped into the following three categories:

**Reduction of medication errors due to the adoption of electronic prescribing systems.** Based on data from the American Society of Health System Pharmacists (ASHP) and the 2007 American Hospital Association (AHA) Electronic Health Record (EHR) Adoption Database—A Supplement to the AHA Annual Survey, it was estimated that approximately 26 percent of all in-hospital prescription drug orders were processed by an e-prescribing system in 2008. This estimate was combined with data from peer-reviewed studies and medication order volume data from the ASHP to estimate that the use of e-prescribing systems averted approximately 14.3 million medication errors in 2008. Further, it was estimated that as many as 86 million medication errors could have been averted in 2008 with greater adoption and use of e-prescribing.

**Adoption and use of CDS in ambulatory settings.** Based on data from the 2008 National Survey of Health Record Keeping among Physicians and Group Practices in the United States, it was estimated that 68.6 percent of physicians practicing in ambulatory settings have at least one of three types of CDS available to them: reminders for guideline-based interventions and/or screening tests, warnings of drug interactions or contraindications, or highlighting out-of-range laboratory results. Of those physicians, 94.4 percent use at least one type of CDS system at least some of the time. Fifty-seven percent of physicians have access to a computerized system that highlights out-of-range laboratory results; 95.8 percent use this feature at least some of the time. Of physicians, 28.8 percent have access to a computerized system that provides warnings of drug interactions or contraindications; 91.9 percent use this feature at least some of the time. Twenty-three point one percent have access to a computerized system for reminders for guideline-based interventions or screening tests; 85.3 percent use this feature at least some of the time. The data shows that CDS use is high in ambulatory settings where it is available. Adoption and use of CDS technologies is higher for physicians working in ambulatory care practices that are larger, multi-specialty, and/or located within a hospital medical center.

**Adoption of CDS in hospitals.** Based on data from the 2007 EHR Adoption Supplement to the AHA Annual Survey, it was estimated that in 2008, 65 percent of hospitals (3,054 of 4,701) in the study population had adopted at least one of six types of CDS (clinical guidelines, clinical reminders, drug allergy alerts, drug-drug interaction alerts, drug-laboratory interaction alerts, or drug dosing support). CDS technologies that inform courses of action (clinical guidelines, clinical reminders, and drug dosing support) were adopted at a lower rate than CDS technologies that correct courses of action (drug-allergy alerts, drug-drug interaction alerts, and drug-lab interaction alerts). Further, adoption was higher among hospitals that were larger, members of hospital systems, major teaching hospitals, or urban hospitals.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation

* OMB determined that developing measures or estimates for the number of patients who can electronically access information on medication therapy was outside AHRQ's scope; therefore this particular objective was retired.
PCMH Resource Center Public and Private Web Portals

Principal Investigator: Syed, Dani
Organization: Booz Allen Hamilton
Contract Number: 290-09-00005I-3
Project Period: September 2009 – September 2012
AHRQ Funding Amount: $250,000
Summary Status as of: December 2010

Target Population: Not Applicable

Summary: The patient-centered medical home (PCMH) model has the potential to transform the delivery of primary health care by providing preventive services and coordinated, team-based care that follows patients across treatment settings and episodes. The Agency for Healthcare Research and Quality (AHRQ) is investing in the development of an infrastructure to further public understanding of PCMH and the role of health information technology (IT), including implications for provider payment, patient education, provider organization and workflow, and quality reporting. The concept of a patient-centered medical home has been embraced by many different stakeholders within the health care system. National physician organizations, consumer organizations, disease advocacy organizations, employers, and payers all have endorsed PCMH as a way to provide care that meets the Institute of Medicine’s dimensions of quality: safe, patient-centered, timely, efficient, and equitable. With its intuitive approach of coordinating care from the perspective of the patient rather than the delivery system, and its emphasis on a team of clinicians working in partnership with patients and families to achieve positive outcomes, the PCMH presents a model of care that can realize the goals of many different stakeholders.

Through its Health IT Portfolio, the Prevention and Care Management Portfolio, and the Center for Primary Care, Prevention, and Clinical Partnerships, AHRQ is exploring the potential of PCMH models to transform primary care services to improve the quality, safety, effectiveness, and efficiency of care. AHRQ is investing in research, white papers, implementation tools, collaborative meetings, and other activities related to primary care transformation. Additionally, AHRQ is leading the development of a conceptual infrastructure for supporting and publicizing patient-centered medical home initiatives and efforts undertaken by the Federal government.

The aim of this project is to assist AHRQ in providing the IT infrastructure and support for a public Web portal to aid the dissemination of information about PCMH activities, research, and outcomes, and a private Web portal to facilitate the collaboration of the Federal working group on the primary care redesign efforts.

Project Objectives:

- Develop and deliver project schedule and cost estimate. (Ongoing)
- Review scheduled milestones with task order officer. (Ongoing)
- Update schedule and resource estimate based on client feedback. (Ongoing)
- Develop and deliver draft project plan. (Ongoing)
- Prepare and deliver monthly progress reports. (Ongoing)
• Conduct monthly status meetings. (Ongoing)
• Conduct monthly quality control plan updates. (Ongoing)
• Report on monthly quality assurance and quality control surveillance inspections. (Ongoing)
• Provide monthly updates to standard operating procedures. (Ongoing)
• Provide monthly 508 Compliance plan status updates. (Ongoing)
• Provide on-going support to both the public and private portals. (Ongoing)
• Update citations database with latest data on both the public and private portals. (Ongoing)
• Develop citations admin module. (Ongoing)
• Review prototype-level tool. (Ongoing)
• Develop a Department of Defense (DOD) and Veterans Affairs (VA) collaboration page. (Ongoing)
• Develop PCMH private portal membership directory. (Ongoing)
• Provide PCMH private portal updates. (Ongoing)

2010 Activities: The project team completed the following activities in 2010.
• PCMH Citations Administrative Module: Completed and deployed the tool to the test environment. Once key users are trained on tool use, the citations database updates and minor changes will be directly available through an easy-to-use interface on the live site.
• PCMH DOD/VA Users: Added more than 240 users to the PCMH private portal, including account creation, custom individual e-mail notification, environment setup, and custom page development for the PCMH DOD/VA user community.
• PCMH JIRA Support Form: Deployed an issue and ticket management system support forms to both public and private portals to facilitate and track e-mail communications regarding portal work products.
• PCMH Citations Database Update: Successfully migrated the latest PCMH citations database to the public and private portals. This is intended to be the final manual data migration. All future data migrations can be done directly through the PCMH citations admin module on the live site, once it is deployed.
• PCMH Private Portal Re-Design: Significantly redesigned the private portal to support new content areas including white papers, meeting materials, and agency pages for AHRQ, the Centers for Medicare and Medicaid Services, the Health Resources and Services Administration, VA, DOD, and the National Institutes of Health. Content is continually updated to increase the value to the user.
• In September 2010, there were approximately 100 registered PCMH private portal users, approximately 100 total registered PCMH only private portal users, and zero registered DOD/VA users.

Preliminary Impact and Findings: There are no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Synthesis and Dissemination
Barriers to Meaningful Use in Medicaid

Principal Investigator: Thompson, Chuck, Ph.D.
Organization: Research Triangle Institute
Contract Number: 290-07-10079-2
Project Period: June 2010 – June 2012
AHRQ Funding Amount: $396,722
Summary Status as of: December 2010

Target Population: Adults, Medicaid, Pediatric*, Safety Net

Summary: The Health Information Technology for Economic and Clinical Health Act offers financial incentives for Medicaid providers to adopt and meaningfully use certified electronic health record (EHR) technologies. To ensure that eligible professionals, including physicians, dentists, certified nurse-midwives, nurse practitioners, and some physician assistants, are able to qualify for and access these incentives, this 2-year project was initiated to study the barriers that Medicaid providers encounter when they try to achieve meaningful use as defined in the Centers for Medicare and Medicaid Services’ (CMS) EHR Incentive Program. The project is designed to develop actionable recommendations to help Medicaid providers take advantage of incentive payments, achieve meaningful use, and ultimately use health information technology (IT) to improve health care for the Medicaid population.

The data collection methods for this project include both in-person and virtual focus groups with physicians, pediatricians, dentists, and mid-level providers. A technical expert panel (TEP) comprised of key stakeholders, including staff from the Office of the National Coordinator for Health IT, CMS, and the Health Resources and Services Administration, will provide guidance on the research plan, data collection design and implementation, data analysis, and the final report recommendations.

These activities will help Federal stakeholders understand the barriers to meaningful use among Medicaid providers and will inform future Federal regulations, particularly in the development of meaningful use criteria for Stages 2 and 3. This project will yield actionable recommendations to increase effective EHR use by Medicaid providers to improve health care quality and will inform the development of recommendations for technical assistance to overcome identified barriers.

Project Objectives:

- Identify the barriers to eligibility for the incentive payments; barriers to adoption, implementation, or upgrading of EHR systems; and barriers to achieving meaningful use. (Ongoing)
- Develop actionable recommendations to overcome barriers identified above, including but not limited to, technical assistance that could be made available to Medicaid providers. (Upcoming)
- Provide data to inform the meaningful use objectives being developed by CMS for Stages 2 and 3 of the EHR Incentive Program. (Upcoming)

2010 Activities: The key project activities included development of the work plan and research plan, development of the data collection instruments, preparations for clearance for data collection from the Office of Management and Budget, planning for pilot testing, and developing recruitment strategies for both the pilot test and main study. In addition, the TEP was convened in September 2010 to provide input
into the research plan and draft data collection instruments. Pilot testing will be completed in January 2011 with data collection for the main study anticipated to begin in summer 2011.

**Preliminary Impact and Findings:** There are no findings to report at this time.

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**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Synthesis and Dissemination

* AHRQ Priority Population
Asthma Measurement Development—Asthma Outcomes Workshop

Principal Investigator: Togias, Alkis, M.D.
Organization: National Institute of Allergy and Infectious Disease
Contract Number: 09-655F-09
Project Period: June 2009 – September 2010
AHRQ Funding Amount: $50,000
Summary Status as of: September 2010, Conclusion of Interagency Agreement

Target Population: Asthma, Chronic Care

Summary: The Asthma Outcomes Workshop is organized by a consortium of governmental and nongovernmental organizations, including the National Institute of Allergy and Infectious Diseases, the National Heart, Lung, and Blood Institute, the National Institute of Child Health and Human Development, the National Institute of Environmental Health Sciences, the National Center on Minority Health Disparities, the Agency for Healthcare Research and Quality, and the Merck Childhood Asthma Network. Representatives of these organizations have formed a planning committee that has overall responsibility for the workshop. The workshop is supported by these organizations and by a grant from the Robert Wood Johnson Foundation.

Seven subcommittees met in advance of the workshop to prepare recommendations on outcomes for their respective domains. The subcommittees are:

- Asthma Symptoms
- Asthma Exacerbations
- Airway Physiology
- Asthma Biomarkers
- Asthma Quality-of-Life
- Asthma Composite Scores
- Asthma Health Care Utilization and Costs

Each subcommittee identified outcomes in its domain and classified them as core, supplemental, or emerging based on their clinical importance and on their level of validation and standardization.

After the workshop, participating National Institutes of Health (NIH) Institutes and Centers considered endorsing a selective set of core outcomes as required outcome measures in NIH-initiated asthma clinical research programs. It is anticipated that the required outcome measures will accelerate the widespread use of the data produced by clinical trials, and genetic and other asthma studies by allowing meaningful comparative analyses and enhancing the level of confidence in the findings of asthma clinical research.

Project Objectives:

- Establish standard definitions and data collection methodologies for validated outcome measures in asthma clinical research. (Ongoing"

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• Identify promising outcome measures for asthma clinical research and comment on their status and further validation needs. (Ongoing**)

2010 Activities: The workshop was held on March 15 and 16, 2010 in Bethesda, Maryland and was attended by more than 80 participants from the scientific and medical community and federal agencies with major research programs in asthma. Representatives from pharmaceutical industry and insurers attended as observers. The workshop resulted in consensus recommendations for core, supplemental, and emerging outcomes for each subcommittee. Following the workshop, each subcommittee revised their reports based on workshop discussions. A manuscript that will combine all the subcommittee reports into one Asthma Outcomes Report is being prepared and will be submitted for publication in a major scientific journal.

Preliminary Impact and Findings: Project findings will be available upon completion of the Asthma Outcomes Report.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

Business Goal: Synthesis and Dissemination

* AHRQ Priority Population

** Work on the report continued beyond the project end date of September 2010.
Using Short Message System (SMS) to Improve Health Care Quality and Outcomes Among HIV-Positive Men

Principal Investigator: Uhrig, Jennifer, Ph.D.
Organization: Research Triangle Institute
Contract Number: 290-06-0001-7
Project Period: May 2009 – March 2011
AHRQ Funding Amount: $399,950
Summary Status as of: December 2010

Target Population: HIV/AIDS, Men*

Summary: More than 230 million cell phones were used in the United States in 2006. Those who frequently have higher rates of cell phone use include younger adults, socioeconomically disadvantaged populations, less-educated young adults, and people who rent or move frequently. Higher levels of use have also been associated with lower levels of self-reported health status and higher levels of participation in health-compromising behaviors. Given the pervasiveness, low cost, and convenience of cell phone technology, short message system (SMS) messages (i.e., text messaging) may be particularly well suited to achieve frequent communication with patients and health-related message delivery where and when these messages can be most effective.

This project studies the potential of SMS to support the adoption and maintenance of healthy behavior among people who live with HIV/AIDS and are treated in an ambulatory care setting. The research entails a thorough review of existing literature and the development and implementation of an SMS-based intervention that provides health communication messages tailored to an individual’s medication and appointment adherence, risk-taking behaviors, social support, general health and wellness, and involvement in health care. The clinical and systemic goals are to develop an intervention that is straightforward, relatively inexpensive, and easily implemented in ambulatory HIV/AIDS care settings. The intervention must be acceptable and useful to people living with HIV/AIDS and must have a positive influence on health care quality and outcomes. The project will evaluate the implementation process and outcomes.

Project Objectives:

- Conduct a thorough review of existing literature, paying close attention to work that has been completed on innovative uses of text messaging in health communication strategies. (Achieved)
- Develop and implement an SMS-based intervention to improve health care quality and outcomes by providing tailored health communication messages to HIV-positive patients who are treated in ambulatory care settings. (Achieved)
- Conduct a process evaluation on implementation and determine the feasibility and potential for implementing the intervention in other ambulatory care settings. (Ongoing)
- Conduct an outcome evaluation that focuses on patient satisfaction and the impact of the intervention on targeted knowledge, attitudes, beliefs, intentions and behaviors, health care quality, and outcomes measures. (Upcoming)
2010 Activities: The project team developed and pre-tested the SMS intervention, and implementation began in July 2010. The first draft interim report was submitted to the Agency for Healthcare Research and Quality in August 2010 and the second draft interim report was submitted in November 2010. Since that time the focus of activities has primarily been on data collection. Data analysis that will inform the final report is expected to be completed in the first quarter of 2011.

Preliminary Impact and Findings: There are no findings to report at this time.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, coordination of care across transitions in care settings, and use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation

* AHRQ Priority Population
Assessing the Impact of the Patient-Centered Medical Home

**Principal Investigator:** West, David, Ph.D.

**Organization:** University of Colorado Health Science Center

**Contract Number:** 290-07-10008-6

**Project Period:** July 2009 – February 2011, Including No-Cost Extension

**AHRQ Funding Amount:** $249,876

**Summary Status as of:** December 2010

**Target Population:** Chronic Care*, Chronic Obstructive Pulmonary Disease, Diabetes, Heart Disease

**Summary:** The University of Colorado Health Sciences Center and the Robert Graham Center are conducting an evaluation of clinical outcomes, financial and economic impact, and patient and provider satisfaction for a medium-sized primary care health system that has implemented a long-established patient-centered medical home (PCMH) model. For 20 years, the WellMed Medical Group has provided care that matches the National Committee for Quality Assurance definition of a PCMH. The study examines outcomes and cost-effectiveness of the PCMH model implemented in WellMed’s 22-practice, 80-provider health system. The evaluation is on overall care; care for specific diseases such as coronary artery disease, diabetes mellitus, and chronic obstructive pulmonary disease; and preventive care, including adult immunizations.

The study team is using a mixed-method qualitative and quantitative evaluation approach. Key informant interviews and participant observations are helping the study team understand how WellMed developed its model of care over time, the critical organizational milestones on the road to becoming a PCMH, and what it means to be a PCMH for WellMed. These qualitative data will provide a narrative foundation that complements and informs the quantitative findings. Data collection is focusing on the strategic changes made to improve health outcomes for different conditions. Health outcome measures will include clinical outcome test values, hospitalization, and mortality. Particular attention will be given to the associated effects of specific elements of the medical home model, including care management, team-based care characteristics, and health information technology (IT) functions.

A trend analysis to assess the impact of the WellMed model on patient and provider satisfaction will examine PCMH-related interventions associated with changes in satisfaction. In addition, a detailed analysis of data will assess the impact of the WellMed PCMH on patient care and health outcomes over a period of 10 years (1997-2006), comparing the full claims data available during various blocks of time with similar patient panels. Purposeful implementation of a comprehensive patient data management system allows internal and external cohort analyses. This study will provide ample opportunity for a well-functioning PCMH to demonstrate any improved outcomes.

**Project Objectives:**

- Determine how WellMed developed their level-3 PCMH model (facilitators, barriers, key components, history, and leadership) using a qualitative methods approach. **(Achieved)**

- Determine if implementation of the WellMed model impacted patient and provider satisfaction. **(Ongoing)**
Project Summaries

- Determine if implementation of the WellMed level-3 PCMH improved care and health outcomes for patients. (Ongoing)
- Determine the incremental in-practice expenses per patient per month required to operate the WellMed PCMH, and the key components of the program. (Ongoing)

2010 Activities: The quantitative comparison analysis is complete and the first of four studies was published in the January 2011 volume of the Journal of Ambulatory Care Management, Case Study of a Primary Care–Based Accountable Care System Approach to Medical Home Transformation. During a qualitative analysis meeting in July, a set of nine questions were identified where supplemental information was necessary from WellMed. The questions were submitted to WellMed, and were incorporated in the overall qualitative analysis and resulting paper. The project team developed a revised timeline describing WellMed’s 20-year evolution based on the qualitative analysis and a table that summarized the important qualitative themes identified to date and how they connect to PCMH, the accountable care organization, and community elements of the WellMed model. The three remaining papers are currently being finalized.

The analyses from the first paper were presented at AcademyHealth Research Meeting in June, at the Agency for Healthcare Research and Quality (AHRQ) Annual Conference in September, at the Patient Centered-Collaborative Care Conference in October, and to the North American Primary Care Research Group in November. The final analyses will be part of an invited panel at AcademyHealth in June 2011. The final report is under review by AHRQ staff.

Preliminary Impact and Findings: Preliminary results from the satisfaction survey analyses show high overall satisfaction with WellMed: 95.9 percent of patients responded they were “very satisfied or satisfied” with the WellMed staff in 2006, and 96.0 percent of patients responded they were “very satisfied or satisfied” in 2009. WellMed Medicare bed days are 60 percent lower than in the fee-for-service population; hospital admission rates, readmission rates, and emergency department visits are all significantly lower as well. WellMed invests 40 to 50 percent more in the primary care setting than is typical of Medicare (approximately 10 percent of total spending). WellMed beneficiaries appear to enjoy mortality reduction of nearly 50 percent compared to an age and sex adjusted peer cohort in Texas.

The qualitative analysis showed 13 emergent themes which will be elaborated on in the final report. Some of the themes include:

- Patients generally report feeling like “one of them”, like they are part of a family, and feel “at home” when visiting their WellMed clinic.
- The guiding principles from which the WellMed model was constructed and the way in which the model has evolved stem from and promote the four pillars of primary care.
- Areas of further work for WellMed include greater focus on: 1) the patient’s experience; 2) definition, clarification, and optimization of roles; 3) bolstering capacity for fast continuous change; 4) patient activation, engagement, and self-management; 5) going from a physician-centric to a more patient-focused team-based model; 6) integrated mental health care; 7) formal linkages and processes to tap into community resources; 8) formal behavior change strategies; and 9) a common IT platform.
- Commonly used mechanisms to promote buy-in and facilitate change include formal and informal trainings and learning opportunities, regular clinic meetings, rewards and incentives, open-door policy for suggestions and ideas, facilitative leadership, and tapping into WellMed resources such as services, tools, and other departments.
**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions, and the electronic exchange of health information to improve quality of care.

**Business Goal:** Knowledge Creation

* AHRQ Priority Population
Evaluation of Computer-Generated After-Visit Summaries to Support Patient-Centered Care

**Principal Investigator:** Williams, Robert, M.D.

**Organization:** University of New Mexico

**Contract Number:** 290-07-10007-2

**Project Period:** September 2009 – March 2012, Including No-Cost Extension

**AHRQ Funding Amount:** $496,788

**Summary Status as of:** December 2010

**Target Population:** Adults

**Summary:** The office visit remains a cornerstone of primary care delivery and is the major venue where health care information is transferred from provider to patient. Yet studies have shown that by the time the patient leaves a facility, he or she may forget as much as 50 percent of the information relayed during the visit, which can negatively affect a patient’s care.

Electronic medical records (EMRs) offer a new method of providing patients with information about their clinical visits through personalized, patient-specific handouts that summarize the topics and recommendations covered during the visit. These after-visit summaries (AVS) have the potential to improve a patient’s retention of information that is needed for adherence to treatment plans and followup instructions. AVS can also facilitate the transfer of information between health settings; however, the content and formatting of the AVS that will optimize patients’ information retention and satisfaction is not known.

This project is employing qualitative data collection methods, including interviews and focus groups, to gather patient and physician input into AVS development. It is taking place in four clinics that use the Certification Commission for Health Information Technology-certified EpicCare EMR, and that serve an ethnically and socioeconomically diverse patient population. The investigating team includes experts in study design and analysis, medical informatics, bilingual and bicultural patient information transfer, qualitative analysis, and clinical practice-based research.

By the end of the project, the study team plans to develop a prototype of the implementation document and guide, which will be evaluated by at least two practice sites that are interested in health information technology (IT) applications but not involved in the study. These sites will provide comment on the potential usefulness of the document in an implementation effort, and the study team will revise the document as warranted. The team will draft and submit a manuscript about the research effort to a peer-reviewed journal, as well as propose processes for active dissemination, including publicity through primary care organizations, academic primary care departments, practice associations, and various organizations active in health IT development. Post downloadable technical findings and after-visit summary-related products will be available on the Internet for incorporation by other primary care providers. The team will prepare a final report that includes all study deliverables (e.g., copies of all research instruments), results, conclusions, suggestions for additional research, and actionable lessons learned.
Project Objectives:

- Ascertain patient attitudes, preferences, and needs regarding the delivery of information at a visit with a primary care physician. (Ongoing)
- Identify primary physicians’ attitudes about the utility, content, and value of the AVS. (Ongoing)
- Develop and test three different versions of an AVS. (Achieved)
- Disseminate the programming instructions needed to deploy an AVS for health care organizations that use the Epic EMR system. (Upcoming)

2010 Activities: The study team conducted a series of interviews with patients of the 12 participating primary care physicians to collect qualitative data regarding their information needs and preferences following office visits with their physicians, as well as their general comprehension of health information conveyed through the AVS received at that particular visit. All interviews were conducted using a general interview guide. Interviews were audio recorded, transcribed, and entered into NVivo 8 software, a qualitative data analysis software which helps organize and analyze non-numerical data. Forty-eight interviews (18 of these in Spanish) were completed, and the themes and responses were tabulated.

In 12 one-on-one interviews, following techniques outlined by other researchers for physician interviews, study staff asked physicians about the educational domains surrounding the AVS, as well as the workflow issues involved with generating them. A physician interview guide was used to engage physicians in discussions of their experience and recommendations for an AVS. The interviewer recorded the sessions and the team encoded the audio using NVivo 8 software. The software allowed researchers to track the major themes and content domains that the interviews captured. Data were summarized using both narrative explanations and direct quotes to emphasize key points.

Program code for the AVS versions was developed and delivered to the participating practice’s IT team. Some internal troubleshooting was necessary because the code was from a slightly different version of Epic; however the IT team was able to address these issues by producing the three versions of the AVS. The three versions were tested and additional modifications were made.

Finally, the research assistants began the process of data collection at the Baylor Family Medicine clinic. Clinic workflow was analyzed and modified to conduct the study and minimize any effect on the workflow for patient care. The team has approval for the draft Patient AVS satisfaction form. The main domains included for evaluation were: content, format, and utility. Questions are formatted in Likert scale format.

Preliminary Impact and Findings: The project has no findings to date.

Strategic Goal: Develop and disseminate health IT evidence and evidence-based tools to support patient-centered care, the coordination of care across transitions in care settings, and the use of electronic exchange of health information to improve quality of care.

Business Goal: Knowledge Creation
Developing a Guide to Identifying and Remediating Unintended Consequences of Implementing Health Information Technology

Principal Investigator:  
Ridgely, Susan, J.D., and Koppel, Ross, Ph.D.

Organization:  
RAND Corporation

Contract Number:  
290-06-0017-5

Project Period:  
May 2009 – June 2011

AHRQ Funding Amount:  
$399,894

Summary Status as of:  
December 2010

Target Population:  
General

Summary:  The use of new health information technology (IT) has been shown to enhance the quality, safety, and effectiveness of medical care. However, there are also unanticipated and undesired effects of health IT implementations, often called unintended consequences, which can be difficult to identify during a technical analysis or pilot test of the new technology. The RAND Corporation, in partnership with Kaiser Permanente of Colorado and the American Health Information Management Association (AHIMA), is developing, conducting user testing, and disseminating an empirically grounded, practical, Web-accessible Guide to Identifying and Remediating Unintended Consequences of Implementing Health IT. This guide synthesizes the existing knowledge on types and causes of unintended consequences and strategies to avoid or address them.

The project is a collaboration of six major health care settings and groups representing a geographically diverse group of provider organizations that includes inpatient and outpatient care delivered in academic and community settings. These organizations are either in the process of implementing a variety of health IT components from several vendors or are planning to do so in the near future. Depending on health IT implementation status and preferences, participants serve either as laboratory sites to help develop the Guide or as pilot sites to test the Guide. Since these organizations include large numbers of locations and practices, they represent a wide range of perspectives and will facilitate pre-post comparisons of the Guide’s pilot-test assessment.

The Guide will help organization leaders understand sociotechnical sources of unintended consequences and may help them avoid undesirable effects in health IT implementations. This knowledge will allow organizations to develop a process to diagnose and cope with emergent consequences. This process may even help prevent undesirable outcomes and provide opportunities for learning about and improving health care delivery. Examples of the target audience for the Guide include regional extension centers, chief information officers, directors of clinical informatics, practitioners serving as champions of health IT, hospital and clinic administrators, and implementation oversight teams. The front-line health IT users, including physicians and nurses, should also find the Guide useful.

Project Objectives:

- Synthesize the existing knowledge on types and causes of unintended consequences and strategies to avoid or address undesired consequences. (Achieved)
- Develop the draft version of the Guide, and instructions for its use. (Achieved)
• Pilot test the Guide at three additional sites to assess its usability and usefulness. **(Achieved)**
• Revise the Guide and disseminate final version in a Web-accessible format through several methods. **(Ongoing)**

**2010 Activities:** The focus of activity was on completing the draft version of the Guide and presenting the draft at several meetings, including: the HMO Research Network Conference in March 2010, the Agency for Healthcare Research and Quality’s (AHRQ’s) Annual Health IT Grantee and Contractor Meeting in June 2010, the AHIMA Convention and Exhibit in September 2010, the EPIC Systems Users Conference in September 2010, and AHRQ’s Annual Conference in September 2010.

The Guide was pilot-tested at three sites to assess its usability and usefulness. Revisions have begun in response to the feedback received in the pilot testing phase.

**Preliminary Impact and Findings:** The project has no findings to date.

**Strategic Goal:** Develop and disseminate health IT evidence and evidence-based tools to improve health care decisionmaking through the use of integrated data and knowledge management.

**Business Goal:** Synthesis and Dissemination
AHRQ’s Health IT Portfolio has consisted of three major grant funding initiatives: the now-closed Transforming Health Care Quality through Information Technology request for applications (RFAs), the Ambulatory Safety and Quality RFAs, and most recently, the Health IT-Oriented Program Announcements. These funding initiatives are described below, followed by the history of AHRQ-Sponsored Health IT Funding Opportunity Announcements (FOAs) and Special Emphasis Notices (SENs).

Transforming Health Care Quality through Information Technology (THQIT) RFAs.

Beginning in 2004, the THQIT program supported different aspects of organizational and community-wide health IT implementation-related activities. The goal of the program was to elucidate various stakeholders’ perspectives and demonstrate the value of health IT implementation and use, particularly in rural hospitals and community-based health care settings. All of the grants in this category were awarded through RFAs that are now closed. The THQIT initiative included 118 grants funded through the following four RFAs:

- **THQIT Planning Grants (P20, HS-04-010):** Designed to support the planning and development phases of health IT infrastructure for communities interested in preparing for effective exchange of health information across multiple community health care organizations. All 38 THQIT planning grants were completed by end of 2006.

- **Initial THQIT Implementation Grants (UC1, HS-04-011):** Intended to assess the extent to which health IT implementation contributes to measurable and sustainable improvements in patient safety, cost, and overall quality of care. All 40 implementation grants were completed prior to 2010.

- **THQIT Implementation Grants II (UC1, HS-05-013) (this was limited competition among the 38 awardees of the Planning Grants):** Designed to serve as implementation grants for institutions that had received and completed a planning grant. Two implementation II grants completed in January 2010; the remaining 14 implementation II grants were completed prior to 2010.

- **THQIT Value Grants (R01, HS-04-012):** Intended to generate insight from various stakeholders’ perspectives on direct and indirect benefits when health IT is used in the delivery of health care, including those related to clinical outcomes, safety, quality, cost savings, effectiveness, and efficiency. All 24 value grants were completed prior to 2010.

Ambulatory Safety and Quality (ASQ) RFAs. The ASQ initiative, established in 2007, supported grants to improve the safety and quality of ambulatory health care in the United States. The five components of the ASQ initiative were: 1) risk assessment in ambulatory care, 2) improving quality through clinician use of health IT, 3) enabling patient-centered care through health IT, 4) enabling patient safety and quality measurement through health IT, and 5) improving management of individuals with complex healthcare needs through health IT. All of the grants in this category were awarded through RFAs that are now closed. The ASQ initiative included 69 grants funded through the following four RFAs:

- **Enabling Patient-Centered Care (PCC) Through Health IT RFA (HS-07-007):** Designed to investigate novel methods or evaluate existing strategies for using health
IT to create or enhance patient-centered models of care in the ambulatory setting. Patient-centered care is responsive to the needs and preferences of individual patients, provides patients with access to their medical information, and empowers patients to be active participants in care decisions and in the daily management of their health and illnesses. Grantees were expected to demonstrate how patient-centered care can improve health outcomes, patient safety, and patients’ reported experience with care. Projects focused on shared decisionmaking; patient-clinician communication; providing patients, their families, and/or clinicians access to patient’s medical information across transitions in care; and/or patient self-management of chronic conditions. This initiative also included set-aside funding for projects that focused on medication management, which worked with Practice-Based Research Networks, or that focused on vulnerable populations and the care settings that serve them. Sixteen total grants were awarded in 2007. All 16 of these grants were active in 2010. Two projects ended in 2010, including one that received a 3-month no-cost extension; the remaining 14 received a 1-year no-cost extension and are therefore scheduled to end in 2011.

- **Improving Quality Through Clinician Use of Health IT (IQHIT) RFA (HS-07-006):** Designed to investigate novel methods or evaluate existing strategies for clinician use of health IT in ambulatory settings to improve outcomes through more effective CDS, medication management, or care delivery. Applicants were encouraged to demonstrate the ability of EHRs and medication management systems to effectively move evidence-based information to the point of care, including the development and utilization of machine-actionable, evidence-based clinical information to providers and participation in health information exchanges. Applicants were encouraged to consider projects that focus on the impact of health IT on outcomes in ambulatory settings and across high-risk transitions of care, the relationship between health IT and workflow redesign, systemic barriers to health IT adoption, care for patients with multiple chronic conditions, and improved use of effective alert strategies for decision support. Twenty-four total grants were awarded in 2007. All 24 of these grants were active in 2010. Six of these projects ended in 2010, including one that received a 3-month no-cost extension. The remaining 18 projects received a 1-year no-cost extension and are scheduled to end in 2011.

- **Enabling Quality Measurement (EQM) Through Health IT RFA (HS-07-002):** Intended to develop safety and quality measures in ambulatory care settings, automate quality measurement, demonstrate the ability of electronic data systems, expand potential safety and quality measures, and demonstrate improved ability to export data for reporting performance on measures and improvement. Of the 17 total grants awarded through this RFA in 2007, 2 grants ended in 2009 and the remaining 15 projects were awarded no-cost extensions. Of these, 13 ended in 2010, and 2 are scheduled to close in 2011.

- **Improving Management of Individuals with Complex Healthcare Needs through Health IT RFA (HS-08-002), also referred to as “Management of Complex Patients” (MCP):** Serves to demonstrate the ability of health IT to assist clinicians, practices, systems, and patients and families in improving the quality and safety of care delivery for individuals with complex health care needs in ambulatory care settings, particularly in high-risk care transitions. The long-term goal of this effort is to ensure that patients receive appropriate
care and management for prevention and treatment of priority conditions. Twelve total grants were awarded in 2008. All 12 of these grants were active through 2010 and are scheduled to end in 2011.

**Health IT-Oriented FOAs.** In September 2008, AHRQ issued three health IT-focused FOAs. The goal of these incremental funding opportunities, which included training and development of individual research skills, was to support projects that could achieve measurable and sustained improvements in quality and safety of health care in ambulatory settings and in transitions of care through the development, implementation, and use of health IT. The applicable settings in which this funding could be applied included: ambulatory, transitions in care between ambulatory settings, or transitions in care between ambulatory and non-ambulatory settings. For the purpose of these FOAs, ambulatory care settings include: health care clinician offices, outpatient clinics, outpatient mental health centers, outpatient substance abuse centers, urgent care centers, ambulatory surgery centers, community-based, school, or occupational health centers, safety-net clinics, pharmacies, homes, independent living centers, and long-term residential care facilities.

New proposals for the R03 and R21 FOAs are still being accepted by AHRQ, while the R18 FOA closed in May 2011. The first grants of these FOAs were awarded in September 2009. The following are general overviews about each of the FOAs.

- **Small Research Grants to Improve Healthcare Quality through Health IT (R03) (PAR-08-268):** Supports different types of small research studies up to 2 years, including: 1) small pilot and feasibility or self-contained health IT research projects, 2) secondary data analysis of health IT research, and 3) economic prospective or retrospective analyses of health IT implementation. A total of seven R03 projects were awarded in 2009 and 2010. All were ongoing in 2010.

- **Exploratory and Developmental Grant to Improve Health Care Quality through Health IT (R21) (PAR-08-269):** Provides funding for health IT exploratory and developmental research projects up to 2 years that support the conduct of short-term preparatory, pilot, or feasibility studies. Health IT implementation research demonstration grants are included in this category. The R21 grants are intended to be more comprehensive and broader in scope than the relatively smaller, self-contained health IT research projects supported by the health IT R03 FOA. A total of 12 R21 projects were awarded in 2009 and 2010, and all were ongoing in 2010.

- **Utilizing Health IT to Improve Health Care Quality Grant (R18) (PAR-08-270):** Supports demonstration research grants up to 3 years that study health IT implementation and use to improve the quality, safety, effectiveness, and efficiency of health care in ambulatory settings and transitions between care settings. A total of 16 R18 projects were awarded in 2009 and 2010, and all were ongoing in 2010.

In April 2011, AHRQ published two new health IT-related FOAs to supplement its existing FOAs and SEN. These funding opportunities are designed to fund basic health IT research and fill gaps in the field that will lead to improved design of health IT systems.

- **Understanding Clinical Information Needs and Health Care Decision Making Processes in the Context of Health Information Technology (R01):** Provides funding for research aimed at elucidating the nature of cognition, task distribution, and work in health care delivery settings. Research projects funded under this FOA will address current knowledge gaps regarding the understanding
of health care providers’ information needs and health care decision making processes. Ultimately, funded research projects will lead to the development and dissemination of evidence that will lead to appropriate design of health IT solutions that truly support clinical needs and lead to better outcomes.

- **Understanding User Needs and Context to Inform Consumer Health Information Technology Design (R01):** Provides funding for projects that will help build a knowledge base about consumers’ personal health information management needs and practices and related design principles. Projects will demonstrate how their research will lead to a better understanding of user needs and how their findings will impact consumer health IT design.

**Other Health IT-Funded Grants.** In addition to the grants described above, the Health IT Portfolio funds additional grants with a health IT focus, which are solicited through the following FOAs:

- **Career and Dissertation Awards:** Designed to enhance the careers of health IT-focused researchers through K-awards and research dissertation grants (R-36). These grants support the career development of clinical and research doctorates who focus their research on one of three priority health IT research areas: 1) health IT to improve the quality and safety of medication management, 2) health IT to support patient-centered care, and 3) health IT to improve health care decisionmaking. There were 12 active career and dissertation awards in 2010; four R36, six K08, and two K01. Of these, three R36 projects ended in 2010 and the remaining nine projects are ongoing. In 2010 there were three new awards: one R36, one K08 and one K01.

- **Conference Support Awards:** AHRQ continues to support conferences through its Grant Programs to support both small (PA-09-070 Small Grant Program for Conference Support [R13]) and large (PAR-09-257 Grant Program for Large Conference Support [R13] and [U13]) conferences to help further its mission to improve the quality, safety, efficiency, and effectiveness of health care for all Americans. In 2010, there were three active R13 grants under the Health IT Portfolio, one funded in 2008 for a large conference and two funded in 2009 for small conferences. Of these, two grants ended in 2010 and one remains ongoing.

- **AHRQ Health Services Research (R01) Purpose:** In March 2007, AHRQ issued an agency-wide FOA (PAR-09-231) for ongoing extramural grants for research, demonstration, dissemination, and evaluation projects to support improvements in health outcomes, strengthen quality measurement and improvement, and identify strategies to improve access. In 2010, there was one active R01 grant under the Health IT Portfolio, funded in 2009.

- **AHRQ Health Services Research Demonstration and Dissemination Grants (R18):** AHRQ supports large research demonstration and dissemination projects, specifically in the AHRQ portfolio priority areas of interest, including the Health IT portfolio. This FOA supports real world demonstration projects that evaluate factors (facilitators and barriers) associated with successful health IT implementation and use and ultimately improve health care outcomes. Facilitators and barriers to health IT implementation may include adequacy of engagement and training of health care staff, patients, and family in the use of health IT; characteristics of the health care setting; organizational processes and practices; workflow; adequacy of health IT implementation plan; nature of technical
support of health IT; integration of new health IT with pre-existing health IT; and other factors.

- **Centers for Education and Research on Therapeutics (CERTs) (U18):** AHRQ was given responsibility for administering the CERTs demonstration program authorized by Congress as part of the Food and Drug Administration Modernization Act of 1997 (Public Law 105-115). AHRQ awarded grants to support the first four centers in September 1999, and the full CERTs program was established as part of the *Healthcare Research and Quality Act of 1999* (Public Law 106-129). CERTs conduct research and provide education to advance the optimal use of drugs, medical devices, and biological products; increase awareness of the benefits and risks of therapeutics; and improve quality while cutting the costs of care. CERTs consist of 14 research centers and a coordinating center. In 2010, there was one active CERT program under the Health IT Portfolio, funded in 2007.
Table A-1. AHRQ-Sponsored Health IT Funding Opportunity Announcements and Special Emphasis Notices

<table>
<thead>
<tr>
<th>Publication Number</th>
<th>Title and Hyperlink</th>
<th>Year Awarded</th>
<th>Number of Grants Active as of 2010</th>
<th>New Grant Proposals May Be Submitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAR-HS-08-268</td>
<td>Small Research Grant to Improve Health Care Quality Through Health Information Technology (IT) (R03)</td>
<td>2009</td>
<td>6</td>
<td>Yes11</td>
</tr>
<tr>
<td>PAR-HS-08-269</td>
<td>Exploratory and Developmental Grant to Improve Health Care Quality Through Health Information Technology (IT) (R21)</td>
<td>2009</td>
<td>13</td>
<td>Yes11</td>
</tr>
<tr>
<td>PAR-HS-08-270</td>
<td>Utilizing Health Information Technology (IT) to Improve Health Care Quality (R18)</td>
<td>2009</td>
<td>16</td>
<td>No12</td>
</tr>
<tr>
<td>NOT-HS-08-014</td>
<td>Special Emphasis Notice: Career Development (K01, K02, K08) and Dissertation (R36) Grants Focused on Health Information Technology (IT)</td>
<td>2009</td>
<td>12</td>
<td>Yes11</td>
</tr>
<tr>
<td>PAR-09-231</td>
<td>Small Grant Program for Conference Support (R13)</td>
<td>2009</td>
<td>2</td>
<td>Yes13</td>
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<tr>
<td>PAR-09-070</td>
<td>AHRQ Health Services Research (R01)</td>
<td>2009</td>
<td>1</td>
<td>Yes14</td>
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<tr>
<td>PAR-09-257</td>
<td>AHRQ Grant Program for Large Conference Support (R13) and (U13)</td>
<td>2008</td>
<td>1</td>
<td>Yes14</td>
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<tr>
<td>RFA-HS-08-002</td>
<td>Ambulatory Safety and Quality Program: Improving Management of Individuals with Complex Healthcare Needs Through Health IT (R18)</td>
<td>2008</td>
<td>12</td>
<td>No</td>
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<tr>
<td>RFA-HS-07-004</td>
<td>Centers for Education and Research on Therapeutics (CERTs) (U18)</td>
<td>2007</td>
<td>1</td>
<td>No</td>
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<tr>
<td>RFA-HS-07-007</td>
<td>Ambulatory Safety and Quality: Enabling Patient-Centered Care Through Health IT (R18)</td>
<td>2007</td>
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<td>No</td>
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<tr>
<td>RFA-HS-07-006</td>
<td>Ambulatory Safety and Quality Program: Improving Quality Through Clinician Use of Health IT (R18)</td>
<td>2007</td>
<td>24</td>
<td>No</td>
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<tr>
<td>RFA-HS-07-002</td>
<td>Ambulatory Safety and Quality Program: Enabling Quality Measurement Through Health IT (R18)</td>
<td>2007</td>
<td>15</td>
<td>No</td>
</tr>
<tr>
<td>RFA-HS-05-013</td>
<td>Limited Competition for AHRQ Transforming Healthcare Quality Through Information Technology (THQIT)—Implementation Grants</td>
<td>2005</td>
<td>2</td>
<td>No</td>
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<tr>
<td>RFA-HS-04-010</td>
<td>Transforming Healthcare Quality Through Information Technology (THQIT)—Planning Grants</td>
<td>2004</td>
<td>None</td>
<td>No</td>
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<tr>
<td>RFA-HS-04-011</td>
<td>Transforming Healthcare Quality Through Information Technology (THQIT)—Implementation Grants</td>
<td>2004</td>
<td>None</td>
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<tr>
<td>RFA-HS-04-012</td>
<td>Demonstrating the Value of Health Information Technology</td>
<td>2004</td>
<td>None</td>
<td>No</td>
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</table>

11. Active until November 17, 2011.
### Appendix B – AHRQ-Sponsored Health IT Contracts

#### Table B-1. AHRQ-Sponsored Health IT Contracts Active in 2010

<table>
<thead>
<tr>
<th>Number of Contracts Active as of 2010</th>
<th>Title</th>
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<tbody>
<tr>
<td></td>
<td>One-Time Requests for Proposals</td>
</tr>
<tr>
<td></td>
<td>6 State and Regional Demonstrations in Health Information Technology</td>
</tr>
<tr>
<td></td>
<td>2 Clinical Decision Support Services</td>
</tr>
<tr>
<td></td>
<td>Master Contracts Through Which Active Health IT Portfolio Task Orders Were Issued:</td>
</tr>
<tr>
<td></td>
<td>3 Program Evaluation and Analysis Task Order Contract (PEATOC)</td>
</tr>
<tr>
<td></td>
<td>8 Primary Care Practice-Based Research Networks (PBRNs)</td>
</tr>
<tr>
<td></td>
<td>5 Evidence-Based Practice Care Centers</td>
</tr>
<tr>
<td></td>
<td>8 Accelerating Change and Transformation in Organizations and Networks (ACTION)</td>
</tr>
<tr>
<td></td>
<td>3 Blanket Purchasing Agreement (BPA) for Support Services</td>
</tr>
<tr>
<td></td>
<td>9 National Resource Centers Task Orders for “knowledge-generating” contracts</td>
</tr>
<tr>
<td></td>
<td>10 Other Task Orders</td>
</tr>
<tr>
<td></td>
<td>4 Interagency Agreements</td>
</tr>
<tr>
<td></td>
<td>1 Purchase Order</td>
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