AHRQ Health Information Technology Ambulatory Safety and Quality

Findings and Lessons From the Enabling Patient-Centered Care Through Health IT Grant Initiative

Preface

The Enabling Patient-Centered Care Through Health IT initiative is part of the Agency for Healthcare Research and Quality's (AHRQ's) Ambulatory Safety and Quality (ASQ) program. The purpose of the AHRQ ASQ program is to improve the safety and quality of ambulatory health care in the United States. The program's components, with the exception of the risk assessment grant initiative (FOA HS-07-003), emphasize the role of health information technology (IT). The ASQ program included the following grant initiatives:

- Enabling Quality Measurement Through Health IT (FOA HS-07-002), which focused on strategies for the development of health IT to assist clinicians, practices, and systems to measure the quality and safety of care in ambulatory care settings.

- Ambulatory Care Patient Safety Proactive Risk Assessment (FOA HS-07-003), which supported research in risk assessment and modeling to identify preventable patient injuries and harms and to inform the development and deployment of intervention strategies to reduce threats to patient safety in ambulatory care settings and during transitions of care.

- Improving Quality Through Clinician Use of Health IT (FOA HS-07-006), which supported research related to the development, implementation, and use of health IT to assist clinicians, practices, and systems in improving the quality and safety of care delivery in ambulatory care settings.

- Enabling Patient-Centered Care Through Health IT (FOA HS-07-007), which was designed to investigate approaches to improve the patient experience of care through the use of health IT in ambulatory care settings.

- Improving Management of Individuals With Complex Healthcare Needs Through Health IT (FOA HS-08-002), which was aimed at clinician and patient and family use of health IT in ambulatory settings to improve outcomes through more effective decision support or care delivery for patients with complex health care needs.

This is one in a series of five reports highlighting findings and lessons from the health IT-focused ASQ grant initiatives. These reports summarize the projects in each initiative and identify practical insights regarding the use of health IT to improve safety and quality in ambulatory settings.

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Executive Summary

This report highlights key findings and lessons from the experiences of 16 projects awarded in 2007 under the Agency for Healthcare Research and Quality's (AHRQ's) Enabling Patient-Centered Care through Health IT (PCC) grant initiative (Funding Opportunity Announcement [FOA] HS-07-007, http://grants.nih.gov/grants/guide/rfa-files/RFA-HS-07-007.html). This initiative was designed to investigate approaches for using health information technology (IT) to create or enhance patient-centered care. It is part of AHRQ's Ambulatory Safety and Quality (ASQ) program, which was designed to improve the safety and quality of ambulatory health care in the United States.

This report summarizes the extent to which the projects addressed the areas of interest of the PCC initiative and identifies practical insights regarding the use of health IT to create or enhance patient-centered models of care in the ambulatory setting. It presents illustrative project findings in an effort to inform research discussion and provide guidance to other entities implementing health IT systems to deliver patient-centered care. As the researchers continue to disseminate findings from these projects, additional lessons may become evident.

The body of the report is organized around four main areas of interest:

- Patient self-management, addressed in all 16 projects, refers to the use of health IT to increase patients' skills and confidence in managing their health.

- Providing access to medical information, addressed in 10 projects, involves the use of health IT for one- or two-way exchange of clinical information about the patient between patients, their caregivers, and providers to inform and tailor the delivery of health care services.

- Patient-clinician communication, addressed in seven projects, includes the use of health IT to support effective clinical interactions during office visits as well as the delivery of clinical services through secure electronic channels.

- Shared decisionmaking, addressed in two projects, involves the use of health IT to support collaboration between patients and clinicians to arrive at informed and mutual decisions about patient care.

The PCC initiative also specified several funding preference areas including two priority areas, one for projects focused on medication management, and a second for projects focused on vulnerable populations or the institutions that serve them. There was also a funding preference for projects being conducted at or by practice-based research networks. A total of 16 projects were funded under the initiative. The projects were carried out in a variety of ambulatory care settings, including primary care and specialty care offices and clinics. They addressed a range of relevant care topics, including several priority areas for health care quality improvement identified by the Institute of Medicine (IOM, 2003).

The names of the principal investigators, their institutions, and the project titles are shown in the Appendix, along with links to additional information about the projects on the AHRQ National Resource Center for Health IT Web site (http://healthit.ahrq.gov/portfolio).

The projects funded under the PCC initiative demonstrated significant progress toward understanding the effective use of health IT to create or enhance patient-centered models of care in the ambulatory setting. Several projects showed a positive impact on process outcomes related to the provision of preventive and chronic care services. In addition, many projects showed a positive impact on various intermediate outcomes, including patient engagement, patient activation, and self-management skills; chronic care outcomes; medication management; health status and function; and patient experience with care. The findings add to the evidence of the positive impact on health care outcomes of health IT applications designed to support patient-centered care.

The studies also highlighted a number of barriers and facilitators to the use of health IT to deliver patient-centered care. For example, researchers encountered and adapted to challenges integrating new health IT systems or components into established clinical information systems and workflows. The continuing interest in use of health IT to improve health and health care delivery, and the positive impact of these approaches on a range of health care outcomes, make the results of this body of research timely and relevant to ongoing efforts to ensure that patient values guide all clinical decisions.

Introduction

This report highlights key findings and lessons from the experiences of 16 projects awarded in 2007 under the Agency for Healthcare Research and Quality's (AHRQ's) Enabling Patient-Centered Care through Health IT (PCC) grant initiative (Funding Opportunity Announcement [FOA] HS-07-007, http://grants.nih.gov/grants/guide/rfa-files/RFA-HS-07-007.html). This initiative was designed to investigate approaches for using health information technology (IT) to create or enhance patient-centered care. The PCC initiative is part of AHRQ's Ambulatory Safety and Quality (ASQ) program, which fostered research on the use of health IT to improve the safety and quality of ambulatory health care in the United States.

This report summarizes the extent to which these projects addressed the areas of interest of the PCC initiative, and identifies practical insights regarding use of health IT to create or enhance patient-centered models of care in the ambulatory setting. The report presents illustrative, initial findings in an effort to inform research discussion and provide guidance to others implementing health IT systems to support the delivery of patient-centered care. The report is organized around the four main PCC initiative areas of interest. Each section includes a brief background section on the topic, followed by a description of how the projects addressed the topic, plus illustrative examples from the projects. In addition, the report includes a synopsis of the impact on outcomes from the projects.

The names of the principal investigators, their institutions, the project titles, and the PCC areas of interest addressed in each project are included in the Appendix, along with links to additional information about the projects on the AHRQ National Resource Center for Health IT Web site (http://healthit.ahrq.gov/portfolio).

Patient-Centered Care

Patient-centered care integrates the perspectives, understanding, and preferences of patients into the delivery of health care. The ability to deliver patient-centered care depends upon an effective clinician-patient partnership in which the clinician's recommendations are informed by an understanding of the individual patient's needs and life context (e.g., home life, job, and family relationships). In addition, patient-centered care takes into account the perspectives of the patient's family and other informal caregivers, when appropriate. The concept is encapsulated in the Institute of Medicine definition of patient-centered care, "care that is respectful of and responsive to individual patient preferences, needs, and values [and those of family and friends] and ensuring that patient values guide all clinical decisions" (IOM, 2001, p. 40).

Health IT Definitions

Several health IT concepts are referred to frequently in the discussion of the PCC initiative.

An electronic health record (EHR) is an electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization (NAHIT, 2008).

The term personal health record (PHR) describes a range of technologies that enable an individual to manage, share, and control an electronic record of health-related information.

These technologies vary in their degree of interconnectedness with an EHR or other source of external data, ranging from standalone systems with no interconnectedness to fully integrated designs (Tang et al., 2006). Health IT systems are interoperable if they have the ability to exchange information and operate in a coordinated, seamless manner (Shortliffe, 2006).

Tailoring is defined as any combination of information or change strategies intended to reach one specific person, based on characteristics that are unique to that person, related to the outcome of interest, and have been derived from an individual assessment (Kreuter et al., 1999).

The Enabling Patient-Centered Care Through Health IT Grant Initiative

The PCC initiative solicited grant applications 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. The initiative highlighted three areas of interest related to patient-centered care: 1) shared decisionmaking and patient-clinician communication, 2) integration of patient information across transitions in care, and 3) patient self-management of chronic conditions. The projects were designed to demonstrate how patient-centered care can improve health outcomes, patient safety, and patients' reported experiences with care, and are summarized in this report across four areas of interest related to patient-centered care that better reflect the topics addressed across these projects. Specifically, shared decisionmaking and patient-clinician communication has been separated into two areas; patient self-management of chronic conditions has been broadened to include all patient self-management; and the area integration of patient information across transitions in care has been recast as providing access to medical information.

- Patient self-management refers to the use of health IT to increase patients' skills and confidence in managing their health.

- Providing access to medical information involves the use of health IT for one- or two-way exchange of clinical information about the patient between patients, their caregivers, and providers to inform and tailor the delivery of health care services.

- Patient-clinician communication includes the use of health IT to support effective clinical interactions during office visits as well as the delivery of clinical services through secure electronic channels.

- Shared decisionmaking involves the use of health IT to support collaboration between patients and clinicians to arrive at informed and mutual decisions about patient care.

Many projects addressed more than one area of interest. As shown in Figure 1, the most commonly addressed area was patient self-management, addressed by all 16 projects. Ten projects studied approaches to providing access to medical information, seven worked on supporting patient-clinician communication, and two addressed shared decisionmaking.

In addition, while the researchers were allowed to develop and demonstrate the use of various types of health IT applications, the initiative did highlight a specific interest in use of personal health records to support the delivery of patient-centered care. The PCC initiative also specified several funding preference areas including two priority areas: one for projects focused on medication management, and a second for project sites serving vulnerable populations.[1] There was also a funding preference for projects being conducted at or by practice-based research

networks.[2] As shown in Figure 2, eight projects were funded under the vulnerable populations preference area, seven under the medication management preference area, and five under the practice-based research networks preference area. In addition, four other projects addressed areas related to medication management and another three focused on vulnerable populations.

The majority of the projects took place in primary care settings. One took place in a specialty care setting (oncology), and several did not involve a particular health care setting as systems or were deployed in patients' homes were available via a Web site not directly associated with a specific health care setting. Organizationally, the clinical settings included Community Health Centers, Federally Qualified Health Centers, physician offices, and hospital-based outpatient clinics.

FIG. 1 — **Grant Initiative Areas of Interest Addressed Across Projects***
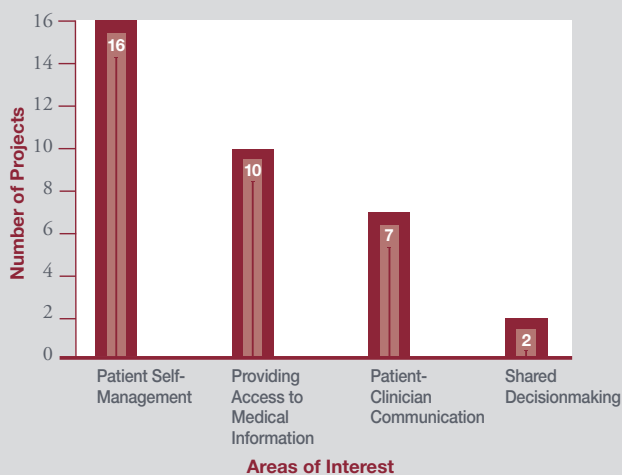
* Some projects addressed multiple PCC areas of interest.

FIG. 2 — **Funding Preference Areas Addressed Across Projects***
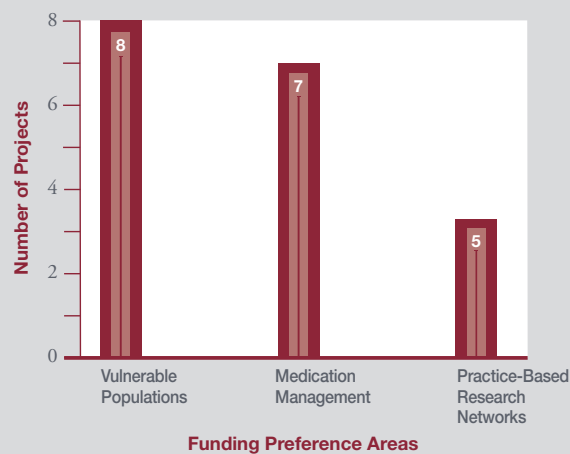
* Some projects addressed multiple funding preference areas.

1   As noted in the funding opportunity announcement "ambulatory health care sites that serve vulnerable populations as those ambulatory health care entities that meet the IOM definition of safety net providers: those providers that organize and deliver a significant level of health care and other related services to the uninsured, Medicaid, and other vulnerable patients. Core safety net providers have an additional distinguishing characteristic in that they, either by legal mandate or explicitly adopted mission, maintain an "open door", offering access to services for patients regardless of their ability to pay (IOM 2002)." Vulnerable patients, as defined by the Institute of Medicine (2002), are those populations served by health care entities that fall outside the medical and economic mainstream, with little or no access to stable health care coverage. As stated in the funding opportunity announcement "these include the uninsured, low-income underinsured, Medicaid beneficiaries, patients with special health care needs, minority populations, immigrant populations and geographically or economically disadvantaged communities." AHRQ recognizes that many rural and inner-city communities are medically vulnerable as well.

2   AHRQ defines a Practice-Based Research Network (PBRN) as a group of ambulatory practices devoted principally to the primary care of patients, affiliated with each other (and often with an academic or professional organization) in order to investigate questions related to community-based practice and to improve the quality of primary care. This definition includes a sense of ongoing commitment to network activities and an organizational structure that transcends a single project.

As shown in Figure 3, the projects also addressed a range of relevant care topics, including several priority areas for health care quality improvement identified by the Institute of Medicine (IOM, 2003). Each project addressed at least one Institute of Medicine (IOM) priority area.

FIG. 3

IOM Priority Areas Addressed Across Projects*

Number of Projects

IOM Priority Area	Number of Projects
Self-Management or Health Literacy	16
Medication Management	11
Diabetes	5
Care Coordination	3
Hyper-tension	3
Obesity	2
Major Depression	2
Asthma	1
Cancer Treatment	1
Frailty Associated with Old Age	1
Tobacco Treatment	1
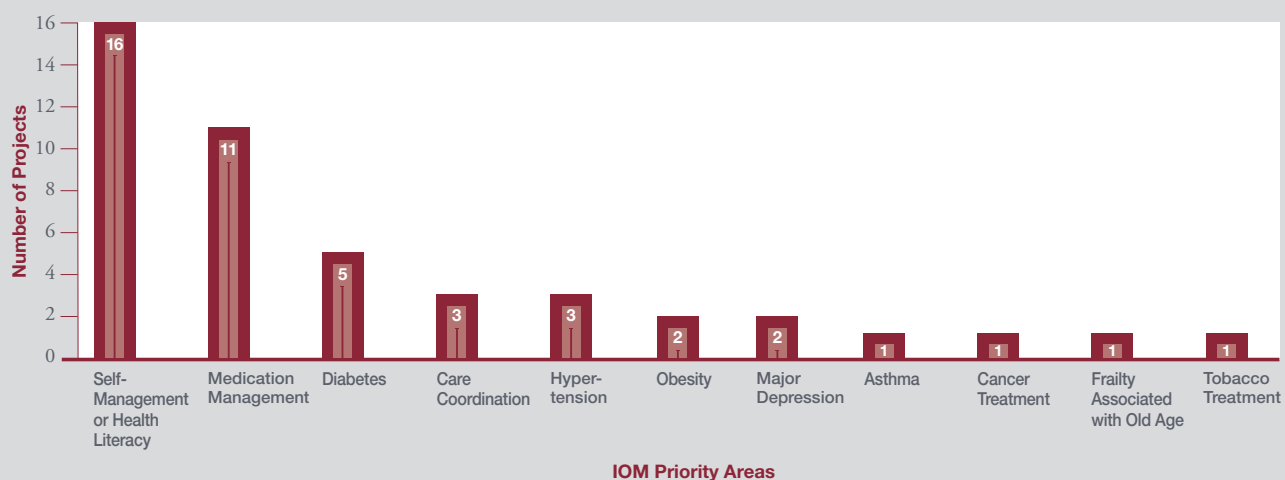
IOM Priority Areas

* Some projects addressed multiple priority areas.

Patient Self-Management

Background

In 2003, the Institute of Medicine defined self-management support as "the systematic provision of education and supportive interventions by health care staff to increase patients' skills and confidence in managing their health problems, including regular assessment of progress and problems, goal setting, and problem-solving support" (IOM, 2003, p. 52). Self-management support programs may be able to help patients with conditions such as asthma, cardio-vascular disease, depression, diabetes, heart failure, and migraine headaches (Pearson et al., 2007). In addition, self-management programs may support patients in managing other health-related activities that may not be specific to a given condition, such as medication management or prevention and wellness.

Highlights From the Projects

As shown in Figure 4, each of the 16 PCC grantees worked to improve patient self-management through the design, implementation, or assessment of health IT applications. Ten projects focused on specific chronic conditions, including four that addressed diabetes, two that focused on hypertension, one on asthma, one on major depression, one on cancer, and one on sleep apnea. Three focused on educating patients and supporting self-management before or after ambulatory visits or after hospital discharge. In addition, three projects worked on supporting patient self-management of prevention, wellness, or monitoring activities. Six of the projects used PHRs to support patient self-management. PHR systems designed or implemented in these projects were enhanced to provide means for patients to document and monitor their own health conditions, along with a platform for delivering educational materials in a usable format.

FIG. 4 Self-Management Focus Areas Addressed Across Projects
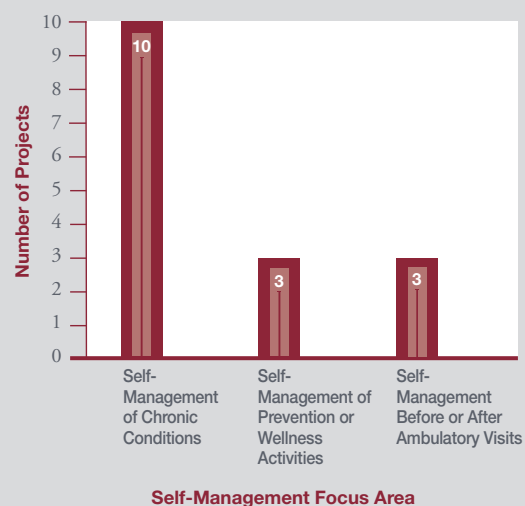
Three projects focused exclusively on patient self-management, while the remaining 13 projects addressed patient self-management along with one or more other PCC initiative areas of interest as described in more detail in relevant sections later in this report. The three projects focused exclusively on patient self-management included the following components and activities:

Edith Burns, M.D., (R18 HS 017276) developed a home-based reminder and feedback system for patients with diabetes that uses audio prompts for glucose testing and medications and provides tailored feedback based on the results. The system was installed on a personal computer with a glucometer interface and programmed according to the care plan developed for the individual by their primary care physician.

Elizabeth Chrischilles, Ph.D., (R18 HS 017034) developed a Web-based PHR that allows patients to enter, view, and print current and past medicines, as well as monitor allergies, conditions, and health events over time. Based on the information entered (e.g., a new medication), the system provides three levels of medication safety alerts: a brief alert containing the basic reason for concern, a more extensive summary-level alert that also includes recommended actions, or a detailed explanation of the alert and recommended actions. The researchers designed the system with the needs of older adults in mind. For example, they found that older adults want to monitor a great deal of information, but are willing to enter very little; medication warnings do not easily translate into consumer-friendly language; and perceived privacy and information security are crucial for this population.

Kate Lapane, Ph.D., (R18 HS 017281) created educational DVDs and associated print materials tailored to the specific drug regimens of individual patients who use warfarin or who have insomnia, depression, heart failure, or diabetes. The goal was to improve medication management for elderly patients with low health literacy. The researchers created tailored DVDs and related paper-based materials by choosing from a library of available segments based on each individual's specific medication history, identified through pharmacy claims or from patient reports. The materials were designed to be culturally and linguistically inclusive, so as to meet the needs of older adults from diverse backgrounds.

This video highlights Dr. Kate Lapane and her team's innovative approach to generate EHR-enabled, culturally informed multimedia medication guidance in Spanish and English for older adults.

Please access this video: WMV (60MB).

For more information about this project (Grant No. R18 HS 017281), an overview is available: PDF (600 KB).

Providing Access to Medical Information

Background

Health IT has great potential to improve access to medical information that can inform and allow for the tailoring of health care service delivery. Through health IT, patients and/or their families and informal caregivers can receive information drawn from patients' medical records to guide followup activities and support self-management and shared decision-making. Health IT also can provide clinicians with access to health information from patients that would not otherwise be readily available, such as patient-reported symptoms or side effects. This information can support timely monitoring and intervention. Some approaches incorporate the flow of information to both patient and provider by supporting bidirectional exchange of medical information between the two.

Highlights From the Projects

As illustrated in Figure 5, ten projects focused on methods to enhance the ability of patients, families, and/or caregivers to share information with clinicians, with the goal of improving monitoring and facilitating timely interventions when warranted. The names of the principal investigators, their institutions, and the project titles for these projects can be found in the Appendix. Two projects assessed methods for patients, families, and/or caregivers to share information with clinicians on symptoms or side effects, one on vital signs and health behaviors, and one on treatment adherence. Six projects used health IT to support the two-way flow of appropriate medical information between patients, families, and/or caregivers and clinicians, including the exchange of care plans, laboratory or radiology results, problem lists, or reminders for needed services.

FIG. 5

Number of Projects by Type of Information Shared Through Health IT

Medication Monitoring Reminders (n=1)

Problem Lists (n=1)

Preventive Service Reminders (n=2)

Laboratory or Radiology Results and Care Plans (n=2)

Treatment Adherence (n=1)

Vital Signs or Health Behaviors (n=1)

Symptoms or Side Effects (n=2)

☐ Projects With One-Way Information Flow From Patients to Clinicians

■ Projects With Two-Way Information Flow Between Patients and Clinicians

More detailed explanations of how these researchers used health IT to provide access to medical information follow:

William Adams, M.D., (R18 HS 017248) used interactive voice-response technology to develop an automated conversational system to gather pediatric previsit personal health information and counsel parents by telephone. The system delivers tailored educational messages and prompts using computer-generated speech in response to voice input from parents (i.e., no typing or visual content) regarding their child's routine health care maintenance, asthma symptom assessment, and medication safety. The system also generates alerts for clinicians based on parental input—for example, if a child is watching too much television or not eating enough fruits and vegetables. The EHR is automatically populated with this information for the clinician to review and accept into the record as appropriate.

Alfred Bove, M.D., Ph.D., (R18 HS 017202) used both Web and telephone platforms to educate, monitor, and provide feedback to asymptomatic patients with hypertension. Patients (primarily low-income, African-American individuals) report self-measured blood pressure, heart rate, weight, steps per day, and smoking status twice each week through a secure Web site or toll-free telephone number that uses recorded verbal prompts and educational messages. The research team responds to text or voice input from patients in an asynchronous manner as appropriate and facilitates communication with primary care physicians. In addition, physicians receive monthly fax updates on each of their patient's blood pressure status, which allow them to more closely monitor blood pressure and antihypertensive medications.

Henry Chueh, M.D., M.S., (R18 HS 017190) designed an application that allows patients and clinicians to establish and monitor clinical care plans for colorectal cancer screening, abnormal radiology results, and new medications that require followup laboratory testing. The system ties into the primary care practice's EHR, as well as laboratory, medication, order entry, and scheduling systems, to automatically monitor whether established care plans are being adhered to. It identifies situations where scheduled actions are overdue, and then notifies both the patient and provider of the needed actions to improve knowledge and enhance self-efficacy. The patient interface allows the patient to enter when they have completed relevant clinical activities, and aligns with the provider interface so that both patients and providers can view the same information.

On February 24, 2010, AHRQ hosted a national Web conference on transitions in care featuring Dr. Jack. Information about this national Web conference can be found at:

http://healthit.ahrq.gov/transitionsincare teleconference

Brian Jack, M.D., (R18 HS 017196) and his research team developed a virtual patient advocate that helps patients avoid adverse events during and after the transition to the ambulatory setting following hospital discharge. Patients use the system each day to monitor adherence to their discharge plan, notify a clinician of any adverse events such as medication side effects, and receive education and counseling regarding relevant health conditions, medications, and followup appointments. The system notifies a clinician of reported adverse events so that any issues can be reviewed and resolved in conjunction with the patient.

Alex Krist, M.D., M.P.H., (R18 HS 017046) created a PHR that gives patients direct access to information in their clinician's EHR, and displays any of 573 tailored recommendations and reminders for 18 clinical preventive services based on information in the EHR and a risk assessment completed by the patient. It also provides primary care practices with an easy-to-use summary of information from the PHR that is transmitted electronically to the EHR task list of the patient's primary care provider for use at the point of care and whenever patients are due for services.

Dr. Alexander Krist's project (Grant No. R18 HS 017046) used a PHR to improve the delivery of preventive services. For more information about this project, an overview is available: PDF (600 KB).

James Mold, M.D., M.P.H., (R18 HS 017188) created a PHR that enables patients to manage preventive services history, monitor personal risk factors and preferences, and create a tailored wellness plan. The PHR includes information from a preventive services reminder system that draws information from the primary care practice's EHR. Patients are reminded to review and update their records, complete a health risk appraisal before their annual wellness visit, and print a copy of the wellness report before the visit so they can discuss it with their primary care provider. During implementation, practice enhancement assistants shared useful lessons across clinics, and helped each practice integrate the PHR into its daily workflow.

This video highlights the PHR Dr. James Mold and his research team created to improve the delivery of patient-centered preventive care.

Please access this video: WMV (60MB).

For more information about this project (Grant No. R18 HS 017188), an overview is available: PDF (600 KB).
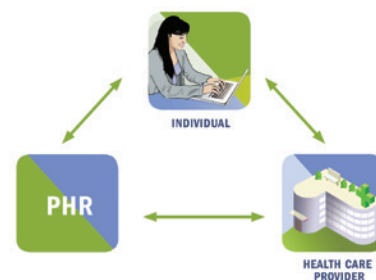
Matthew Samore, M.D., (R18 HS 017308) developed an integrated PHR and EHR to promote patient activation and health management. The system includes a health history and forms for monitoring metrics such as blood pressure, weight, blood glucose, and cholesterol. In addition, patients beginning certain medication regimens receive a structured form to electronically communicate with their clinician. For example, patients beginning antidepressant regimens receive an automatic communication inquiring about suicidal feelings, medication side effects, and adherence, which is returned electronically to the clinic. A new prescription or alteration in dosage for warfarin triggers an email reminder to return for the laboratory test of blood clotting.

Carl Stepnowsky, Ph.D., (R18 HS 017246) developed an interoperable, Web-based intervention for patients with sleep apnea that integrates a wireless continuous positive airway pressure (CPAP) device with a Web site that allows both patient and provider to access adherence and efficacy data on a daily basis. The patient interface includes basic education on sleep apnea and CPAP; recording of adherence, sleepiness, and other indicators; and other educational resources that can promote self-management. The provider interface allows the therapist to rapidly monitor selected parameters for a large number of patients and identify those in need of followup.

Paul Tang, M.D., M.S., (R18 HS 017179) developed an online disease management system that includes wireless uploading of home glucometer readings to the EHR, with graphical feedback correlated to other clinical parameters (e.g., laboratory results, medications, and clinical findings). The system creates a patient-specific diabetes summary status report and tailored care plan, and provides logs to record physical activity and eating habits. It also includes an insulin record and patient-specific educational information and advice via text and video. The system uses pattern-matching technology to process data from the EHR and PHR, including clinical parameters, demographics, disease-related knowledge, attitudes (e.g., distress, self-efficacy), and behavior (e.g., medication adherence, diet, physical activity, self-monitoring), to produce a composite characterization of a patient's state that is displayed in appropriate form to clinicians and patients. This system promotes patient engagement in self-management and facilitates ongoing, followup communications between clinician and patient.

The Web-based PHR evaluated by **Peggy Wagner, Ph.D.**, (R18 HS 017234) for patients with hypertension enables patients to view selected data from the EHR, including problem lists and information on medications, allergies, clinical history, laboratory results, and immunizations. Patients use the PHR to record and monitor health measures such as blood pressure. Research staff, including a nurse, were available by telephone and email to review and assign clinical queries from patients submitted through the PHR to appropriate members of the clinical care team.

On January 25, 2012, AHRQ hosted a national Web conference on the evaluation of PHR systems and their impact on chronic disease featuring Drs. Stepnowsky and Wagner. Information about this national Web conference can be found at:

http://healthit.ahrq.gov/phrevaluation teleconference

Patient-Clinician Communication

Background

Projects that focused on improving patient-clinician communication used health IT for either synchronous or asynchronous secure messaging or electronic visits as a substitute or supplement for in-person clinical visits, or to support effective clinical interactions during office visits by helping patients and/or providers better prepare for the visit. Electronic communications can enhance and extend the personal connections patients have with their doctors and other clinicians, offering patients the opportunity for sustained collaboration and more involvement in their own care. Such communications are emerging as a key component in patient-centered care and patient-centered relationships (Francis, 2012).

Highlights From the Projects

A total of seven projects addressed this area of interest. Four of these used health IT to support communication between patients and clinicians or care teams as a substitute or supplement to in-person clinical visits. The names of the principal investigators, their institutions, and the project titles for these projects can be found in the Appendix. The projects used secure messaging components of EHRs or PHRs rather than regular email. Several used structured forms or templates that standardize the information to improve its completeness and consistency and reduce the possibility of misunderstandings, with the information becoming a part of the medical record. Examples from the studies include the following:

The integrated PHR and EHR evaluated by **Dr. Samore** supports requests for medications and asynchronous e-visits with clinicians. The project team created structured e-visit templates for several diseases to ensure that patients could easily transmit pertinent information to clinicians.

Dr. Tang used a Web-based PHR with structured forms in which the patient enters information relevant to diabetes management (e.g., dietary intake, type and duration of physical activity, home blood pressure, insulin doses, and weight) and uploads wireless home glucometer readings. Interactive visual data displays allow patients to visually monitor progress towards goals. The PHR also supports secure messaging with a nurse care manager and a dietitian.

On March 30, 2011, AHRQ hosted a national Web conference on putting the patient back in patient-centered care featuring Drs. Chrischilles and Tang. Information about this national Web conference can be found at:

http://healthit.ahrq.gov/patientcenteredcare
teleconference

The Web-based PHR **Dr. Wagner** and her research team used for patients with hypertension includes secure messaging capability among other functions. All messages are sent to a study nurse who triages them, arranges appointments, and communicates with physicians and nursing staff as needed.

Dr. Mold and his team included in their PHR secure messaging with primary care providers, as this was one of the features requested by participants in the design phase of the project. The researchers added the feature as one way of associating the management of preventive and wellness services to more frequently occurring events such as office visits and other communication between patients and clinicians.

Three of the projects used health IT to help patients or clinicians prepare for office visits by helping patients structure clinically relevant information and providing a means for sharing that information with clinicians either before or during the visit. These projects include the following:

Clinicians review the information in the EHR that has been populated by the system developed by **Dr. Adams** and his team for gathering pediatric previsit health information to guide conversations with the parent during the office visit and intervene as necessary.

Elizabeth Hahn, M.A., (R18 HS 017300) developed a multimedia talking touchscreen for low-literacy patients diagnosed with breast or colorectal cancer. The tool was designed to educate patients, promote adherence to recommended treatment, and improve patient-clinician communication during the transition between active cancer treatment and followup care. Patients self-administer the health literacy test and outcomes questionnaire using a kiosk in the clinic waiting room. The kiosk helps patients create survivorship plans, which they can then bring to their primary care physicians for discussion.

On December 18, 2012, AHRQ hosted a national Web conference on practical models to improve patient-clinical communication using health IT featuring Dr. Adams, Ms. Hahn, and Dr. Wolf. Information about this national Web conference can be found at:

http://healthit.ahrq.gov/patientclinician communicationteleconference

Michael Wolf, Ph.D., M.P.H., (R18 HS 017220) programmed the EHR at a primary care practice to print tailored medication reconciliation worksheets handed to each patient in the waiting room. The sheets are prepopulated with the patient's existing medication list, reviewed and updated by the patient, and used to facilitate discussions with the clinician during the visit. Clinicians found the intervention easy to incorporate into their usual workflow.

Vulnerable Populations

The PCC initiative had a specific interest in funding project sites serving vulnerable populations. These groups are at risk of not obtaining necessary medical services because of financial, social, geographical, or health-related barriers. Eight of the projects were funded under the vulnerable populations funding preference area. An additional three projects focused on vulnerable populations. Together, these 11 projects designed interventions to facilitate patient-centered care for a variety of vulnerable populations:

- Drs. Adams, Bove, Burns, Jack, Lapane, Schillinger, Stepnowsky, and Wolf included low-income, uninsured, or underinsured populations in their studies.

- Ms. Hahn, Dr. Lapane, and Dr. Schillinger worked with low-literacy populations.

- Dr. Samore studied rural populations.

- Drs. Adams, Bove, Burns, Jack, Schillinger, Stepnowsky, Wagner, and Wolf focused on minority populations.

Many of these researchers used focus groups, user testing, and other qualitative research methods to design their interventions to be sensitive to the language, technological, and other unique needs and considerations for the delivery of patient-centered care to these populations.

Shared Decisionmaking

Background

Shared decisionmaking is a process in which both the patient and physician contribute to the medical decisionmaking process to arrive at informed, mutual choices. Health care providers explain treatment alternatives to patients, along with information on risks and benefits, so that patients can choose the option that most closely aligns with their values and priorities. Patient participation can lead to greater self-efficacy, which, in turn, can lead to better health outcomes (Heisler et al., 2002). Furthermore, when a patient more fully participates in the decisionmaking process, self-management behaviors improve (Hibbard et al., 2007).

Highlights From the Projects

Two studies using health IT in different ways to support a shared decisionmaking process:

The system **Dr. Chueh** and his team used allows patients to collaborate with clinicians asynchronously to establish and monitor clinical care plans for selected conditions. Providers can propose a care plan or patients can request one on specific clinical issues built into the system. In either case, the care plan can be customized to some degree within the structure of predefined templates until both the clinician and the patient "accept" the plan. The system then sends notifications and reminders to both parties based on the plan. The investigators conducted a series of focus groups, some including patients, others including clinicians, and still others including both patients and clinicians, as part of an iterative design effort. The focus group findings led to designing the clinician user interface so that clinicians could quickly find the appropriate care plan template within the EHR, select patient-specific options, and review and propose the care plan. Focus group findings also led to designing the patient interface so that patients could accept care plans with little training, and to enable topic-specific communication with clinicians.

Dean Schillinger, M.D., (R18 HS 017261) and his project team developed an automated telephone system to support shared decisionmaking. The system was programmed with a rotating set of queries about diabetes self-care, psychosocial issues, and access to preventive services. The system uses medication claims data to provide tailored queries and prompts based on each patient's medication history, with patients responding via touch-tone commands. Based on their answers, patients either hear relevant automated health education messages or receive a telephone call within 3 days from a language-concordant health coach who provides education and engages in collaborative goal-setting and action planning. Health coaches received training in behavior change counseling and communication for patients with diabetes to enhance the collaborative relationship and improve action planning.

Medication Management

Health IT has the potential to improve medication management phases such as prescribing and ordering, order communication, dispensing, administration, and monitoring as well as education and reconciliation through use of both clinician and patient-focused applications (McKibbon et al., 2011). Seven projects were funded under the medication management preference area. Four other projects also addressed areas related to medication management. All 11 projects addressed different aspects of medication management using interactive voice recognition, videos, PHRs, and EHRs:

- Drs. Adams, Chrischilles, Samore, and Wolf focused on improving medication reconciliation.

- Drs. Burns, Lapane, Schillinger, and Tang focused on improving patient adherence to medication plans.

- Drs. Adams, Chueh, Jack, and Wagner focused on medication safety and monitoring.

All of these projects also incorporated patient education on medications into their interventions.

Impact on Outcomes

This section summarizes the impact of the projects on several types of outcomes, including process outcomes,[3] intermediate outcomes,[4] and health outcomes.[5] Several projects showed a positive impact on process outcomes related to the provision of preventive and chronic care services. In addition, many projects showed a positive impact on various intermediate outcomes, including patient engagement, patient activation, and self-management skills; chronic care outcomes; medication management; health status and function; and patient experience with care.

Selected results from the PCC initiative are highlighted below.

Process Outcomes

Clinician Acceptance and Use of Health IT

The technologies used in these studies were typically new and not in routine clinical use. Because of the developmental nature of the systems, some of the researchers experienced technology malfunctions or implementation challenges. This is not uncommon for new and complex interventions deployed in a research setting (Jimison et al., 2008). The experiences across projects highlight the importance of ensuring that systems integrate well into preexisting clinical information systems and with clinical workflows. A health IT system that requires clinicians and office staff to change their workflow and/or takes additional time and effort may not be widely used. As described below, three project teams initially faced significant challenges in this area, leading, in many cases, to changes designed to better integrate the system into existing clinical workflows:

Dr. Bove initially offered physicians access to a Web site where they could view blood pressure readings and other information transmitted by patients biweekly. No physicians used this system, so the researchers created an automatic faxing system that provided physicians with monthly summaries on each patient. This approach worked much better, as physicians could easily access the information when patients came in for a visit. Overall, 98 percent of patients reported that their blood pressure was recorded, and 94 percent reported discussing blood pressure management with their physicians during visits.

Dr. Mold found that clinicians reacted negatively to the first version of the PHR (implemented using a full-size kiosk in the waiting room), finding it too intimidating and conspicuous for private medical information. Instead, they supported replacing the kiosk with a small tablet computer with a touch screen, which fit in better to existing workflows. The researchers also sent out practice enhancement assistants to the sites to share useful lessons from peers, and help each clinic integrate the prevention portal into its daily workflow.

Dr. Wagner found physician acceptance of the PHR to be limited, as they expressed concerns about increased workload and lack of time to use it during visits. They also expressed concerns that patients might be confused, worried, or offended by some of the information they may be able to view via the PHR, such as their visit notes. To address physicians' concerns and increase acceptance of the PHR, the implementation team engaged in relationship building with the providers and allowed the physicians to drive the decisions about what patient information was appropriate to release.

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3 Process outcomes include actions taken by members of a clinical team or by patients in the course of care delivery or self-management.
4 Intermediate outcomes are indicators that are impacted by processes and that may precede or lead to health outcomes.
5 Health outcomes are symptoms and conditions that patients can feel or experience.

Preventive and Chronic Disease Management Processes

Six projects demonstrated impact in adherence to recommended preventive services or chronic disease management practices.

Dr. Bove found that the monthly summary reports provided to physicians led to a significant increase in the number of medications prescribed to hypertensive patients from an average of 2.2 medications to an average of 2.34. There was no change in the control group.

Dr. Krist found that users of the PHR had a significant increase in the proportion of recommended preventive services that were up to date from 68 percent to 74 percent. By contrast, the proportion of up-to-date services fell in both the control group and members of the intervention group who did not use the PHR.

On April 8, 2010, AHRQ hosted a national Web conference featuring Dr. Krist on patient empowerment. Information about this national Web conference can be found at:

http://healthit.ahrq.gov/patientempowerment teleconference

Dr. Mold found that 84 percent of adult study participants received all recommended preventive services, well above the 67-percent rate in the control group. Among children, 95 percent of the study participants received all recommended services, compared to 87 percent in the control group. At the end of the study, participants had significantly fewer unaddressed preventive service needs than did those in the control group.

Dr. Schillinger showed that participating patients exhibited improvements in key processes tied to better diabetes outcomes, such as regular glucose monitoring and foot examinations.

In the study conducted by **Dr. Stepnowsky**, patients receiving CPAP monitoring used the device an average of one additional hour per night, although this increase did not have a significant effect on sleep quality.

Dr. Tang found that participants experienced a significantly greater increase in the number of times their diabetes medication regimen was intensified, as compared to the control group receiving usual care.

Intermediate Outcomes

Patient Engagement, Activation, and Self-Management

Six projects show improvement in patient engagement, activation, and self-management skills, as described in the following sample findings:

Dr. Adams found that parents reported that their children's pediatricians were more likely to discuss important issues identified by the previsit telephone system, including depressive symptoms exhibited by the parent, tuberculosis risk for the child, and medication use. Overall, 89 percent of parents would recommend using the system before scheduled visits.

In the study conducted by **Dr. Mold**, participants reported a greater increase in the degree of patient activation as compared to the control group; 80 percent of participants felt that the system facilitated participation in their own care.

In the study led by **Dr. Tang**, a majority of participants reported that the online diabetes management system and self-management support increased confidence in their ability to manage diabetes (93 percent), including making and maintaining lifestyle changes (75 percent and 70 percent, respectively). Participants' overall knowledge about diabetes and about blood glucose testing and disease-related complications increased. The majority of participants reported that the system helped them to remember to take medications more regularly, make healthy food choices more often, increase levels of physical activity, complete laboratory and home-based blood glucose tests more regularly, and better keep up with preventive care needs.

Dr. Lapane found that the 76 percent of patients watching the tailored DVDs (older adults with low health literacy) found them to be helpful. Many watched them more than once and/or shared them with friends and family. Overall, the program had a positive impact on medication self-management, including self-efficacy, reading of labels, storing of medications, and obtaining help with medications. Among those with insomnia or diabetes, knowledge scores increased after watching the DVDs.

On August 18, 2011, AHRQ hosted a national Web conference on utilizing health IT to improve medication management for the care of elderly patients featuring Dr. Lapane. Information about this national Web conference can be found at:

http://healthit.ahrq.gov/medicationmanagement forelderlyteleconference

Patients that participated in the study led by **Dr. Samore** scored highly on several patient activation measures, with over 90 percent reporting that they always or almost always were responsible for managing their own health and were confident that they could take actions to prevent or minimize symptoms.

Dr. Schillinger showed that, when combined with medication counseling, the health information and coaching intervention generated statistically significant improvements in diabetes self-efficacy and some subscales of self-management behaviors (e.g., exercise).

Patient Experience and Patient-Clinician Communication

AHRQ encouraged the PCC grantees to use the CAHPS® Clinician & Group Survey to assess patients' perception of and experience of care, especially in the areas of access, clinician communication, and shared decisionmaking. Four researchers used CAHPS® or other instruments and showed an impact on patient satisfaction and patient-clinician communication:

Dr. Bove found that participants reported an increase in the quality of patient-clinician communication with the score on the CAHPS® patient-clinician communication composite rising from 89 percent before the intervention to 93 percent after the intervention.

In the intervention by **Dr. Mold**, participants' composite rating of the "degree of patient-centeredness of care" rose by 0.32 points, compared to a 0.43-point decline in that score in the control group over the same time period.

Dr. Samore found that patients who used the integrated PHR and EHR had a high level of satisfaction with their care (9.34 on a scale from 0 to 10, with "10" indicating the "best medical care possible"). Nearly two thirds of participating patients reported that their provider was always thorough during treatment. Participants also gave high ratings to the quality of their relationship and communication with their physician (although there was no comparison group).

Dr. Tang showed that 93 percent reported that the program suited their needs and lifestyle, with 88 percent being either very satisfied (73 percent) or somewhat satisfied (15 percent) with it.

Disease Management and Control

Four of the projects found improvements in measures related to the control of chronic diseases such as hypertension and diabetes. Often, these improvements were larger among more frequent users of the health IT system. In these cases, it is possible that the health IT system has different impact for different user types, which may warrant further research.

Dr. Bove found that participating patients with hypertension had a mean reduction in diastolic blood pressure of 18 mmHg, significantly larger than in the control group, although the control group also saw meaningful improvements. This effect was more pronounced in patients who did not have diabetes.

Dr. Burns found that the overall program had little impact on blood glucose levels in those with diabetes. However, frequent users experienced a significantly larger reduction in blood glucose levels (0.5 points) than did infrequent users (0.06 points).

Dr. Tang found that participants in the online diabetes management program had significantly better glycated hemoglobin (hemoglobin A1c) control than did members of the control group; a gap still existed at 12 months, although the difference was no longer statistically significant. Participants had significantly better control of their low-density lipoprotein at 12 months than did members of the control group.

Dr. Wagner found that a subset of the most active PHR users exhibited a statistically significant decline in diastolic blood pressure (5.25 points) and a more modest, nonsignificant decline in systolic blood pressure.

Medication Management

Three of the projects showed an impact on different aspects of the medication management process. Selected results on aspects of medication management include the following:

In the study led by **Dr. Adams**, parents who used the pre-visit telephone system to report on their child's health issues reported feeling more prepared for their child's visit (81 percent versus 68 percent), were more likely to bring their medications to the visit (20 percent versus 9 percent), and were more likely to discuss medication issues with the clinician (85 percent versus 72 percent) compared to the usual care group.

Dr. William Adams' project (Grant No. R18 HS 017248) used interactive voice-response technology to develop an automated conversational system to gather pediatric previsit personal health information and counsel parents by telephone. For more information about this project, an overview is available: PDF (600 KB).

Dr. Chrischilles determined that frequent users of the medication management PHR reported significantly improved medication management behaviors such as the use of potentially inappropriate medications or the use of multiple non-steroidal anti-inflammatory drugs, better medication reconciliation by providers, and greater recognition of medication side effects than did infrequent and non-users of the system.

Dr. Wolf demonstrated that participants were more likely to have their medications reconciled by 6 weeks after the visit (49 percent versus 31 percent), and nearly seven times more likely to have omissions from the EHR medication list corrected (46 percent versus 8 percent) than those in usual care.

Health Outcomes

Only one study reported impact on a health outcome:

Dr. Schillinger showed that participating patients (all of whom had diabetes) reported significantly greater improvements in physical function after six months than did similar patients in the control group.

Conclusion

The projects funded under the Enabling Patient-Centered Care Through Health IT initiative demonstrated significant progress toward understanding the effective use of health IT to create or enhance patient-centered models of care in the ambulatory setting. They developed and tested a range of approaches to delivering patient-centered care with a focus on providing access to medical information and supporting patient-clinician communication, patient self-management, and shared decisionmaking. These findings add to the evidence of the positive impact on health care outcomes of health IT applications designed to support patient-centered care. The projects also focused on a variety of settings and populations, thus demonstrating the potential of the interventions to improve quality of health care across different populations, including vulnerable populations. One of the areas of interest for this initiative was integration of patient information across transitions in care. Only two projects addressed the use of health IT to support patient-centered care during transitions across settings, indicating the need for further research in this area.

The studies also highlighted a number of barriers and facilitators to the use of health IT to deliver patient-centered care. For example, the researchers encountered and adapted to challenges integrating new health IT systems or components into established clinical information systems and workflows. The findings and lessons gleaned from this initiative can inform researchers and implementers interested in using health IT to support the delivery of patient-centered care. The continuing interest in use of health IT to improve health and health care delivery, and the positive impact of these approaches on a range of health care outcomes, make the results of this body of research timely and relevant to ongoing efforts to ensure that patient values guide all clinical decisions.

References

Crossing the quality chasm: a new health system for the 21st century. Washington, DC: Institute of Medicine, National Research Council, 2001. The National Academies Press.

Francis R. e-Visits: The tipping point - are we there yet? TransforMed Online Resources 2012 http://www.transformed.com/e-Visits/e-Visits_There_Yet.cfm. Accessed July 20, 2012.

Heisler M, Bouknight RR, Hayward RA, et al. The relative importance of physician communication, participatory decision making, and patient understanding in diabetes self-management. J Gen Intern Med 2002 17(4):243–52.

Hibbard JH, Mahoney ER, Stock R, et al. Do increases in patient activation result in improved self-management behaviors? Health Serv Res 2007 42(4):1443–63.

Institute of Medicine. Priority areas for national action: transforming health care quality. Washington, DC: The National Academies Press; 2003.

Jimison H, Gorman P, Woods S, et al. Barriers and drivers of health information technology use for the elderly, chronically ill, and underserved. Evidence Report/Technology Assessment No. 175 (Prepared by the Oregon Evidence-based Practice Center under Contract No. 290-02-0024). AHRQ Publication No. 09-E004. Rockville, MD: Agency for Healthcare Research and Quality. November 2008.

Kreuter MW, Farrell D, Olevitch L, et al. Tailored health messages: customizing communication with computer technology. Mahwah: Lawrence Erlbaum; 1999.

McKibbon KA, Lokker C, Handler SM, et al. Enabling medication management through health information technology. Evidence Report/Technology Assessment No. 201 (Prepared by the McMaster Evidence-based Practice Center under Contract No. 290-2007-10060-I). Rockville, MD: Agency for Healthcare Research and Quality, April 2011. AHRQ Publication No. 11-E008-EF.

Pearson ML, Mattke S, Shaw R, et al. Patient self-management support programs: an evaluation. Final contract report. (Prepared by RAND Health under Contract No. 282-00-0005). Rockville, MD: Agency for Healthcare Research and Quality, 2007. AHRQ Publication No. 08-0011.

Shortliffe EH. Biomedical informatics: computer applications in health care and biomedicine. New York: Springer; 2006.

Tang PC, Ash JS, Bates DW, et al. Personal health records: definitions, benefits, and strategies for overcoming barriers to adoption. JAMIA 2006 13:121-6.

Unequal Treatment: Confronting racial and ethnic disparities in health care. Washington, DC: Institute of Medicine, 2002. The National Academies Press.

Appendix:
Enabling Patient-Centered Care Through Health IT Projects

	Principal Investigator (PI)*	Institution	Project Title**	PCC Initiative Areas of Interest Addressed
📄	Adams, William	Boston Medical Center	Conversational Information Technology (IT) for Better, Safer Pediatric Primary Care	Access to Medical Information, Patient Self-Management, Patient-Clinician Communication
	Bove, Alfred	Temple University	Using a Telemedicine System to Promote Patient Care Among Underserved Individuals	Access to Medical Information, Patient Self-Management
	Burns, Edith	Medical College of Wisconsin	Enhancing Self-Management of T2DM with an Automated Reminder and Feedback System	Patient Self-Management
	Chrischilles, Elizabeth	University of Iowa	Personal Health Records and Elder Medication Use Quality	Patient Self-Management
	Chueh, Henry	Massachusetts General Hospital	Ambulatory Care Compact to Organize Risk and Decisionmaking (ACCORD)	Access to Medical Information, Shared Decisionmaking, Patient Self-Management
	Hahn, Elizabeth	Northwestern University	Implementing a Low-Literacy, Multimedia IT System to Enhance Patient-Centered Cancer Care	Patient Self-Management, Patient-Clinician Communication
	Jack, Brian	Boston Medical Center	Virtual Patient Advocate to Reduce Ambulatory Adverse Drug Events	Access to Medical Information, Patient Self-Management
📄	Krist, Alexander H.	Virginia Commonwealth University	An Interactive Preventive Health Record (IPHR) to Promote Patient-Centered Care	Access to Medical Information, Patient Self-Management
🎥📄	Lapane, Kate	Virginia Commonwealth University	Tailored DVD to Improve Medication Management for Low Literate Elderly Patients	Patient Self-Management
🎥📄	Mold, James	University of Oklahoma	Impact of a Wellness Portal on the Delivery of Patient-Centered Prospective Care	Access to Medical Information, Patient Self-Management, Patient-Clinician Communication
	Samore, Matthew	University of Utah	Patient-Centered Informatics System to Enhance Health Care in Rural Communities	Access to Medical Information, Patient Self-Management, Patient-Clinician Communication
	Schillinger, Dean	University of California, San Francisco	Harnessing Health IT for Self-Management Support and Medication Activation in a Medication Activation in Medicaid Health Plan	Patient Self-Management, Shared Decisionmaking
	Stepnowsky, Carl	Veterans Medical Research Foundation	Enabling Sleep Apnea Patient-Centered Care Via an Internet Intervention	Access to Medical Information, Patient Self-Management
	Tang, Paul	Palo Alto Medical Foundation Research Institute	Patient-Centered Online Disease Management Using a Personal Health Record System	Access to Medical Information, Patient-Clinician Communication, Patient Self-Management
	Wagner, Peggy J.	Georgia Health Sciences University Medical College of Georgia	Using An Electronic Personal Health Record To Empower Patient With Hypertension	Access to Medical Information, Patient Self-Management, Patient-Clinician Communication
	Wolf, Michael	Northwestern University	Using IT for Patient-Centered Communication and Decision Making about Medications	Patient Self-Management, Patient-Clinician Communication

* To access video or written success stories, please select the icons next to the "Principal Investigator" column.
** To access descriptions of each project, please select the respective project title.