

# Incorporating Health IT Into Workflow Redesign: Request for Information Summary Report

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**HEALTH IT**

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# Background

## Significance

The state of health information technology (health IT) research is mixed. There exists conflicting evidence about the effectiveness of computerized alerts and clinical reminders,<sup>1,2,3</sup> computerized provider order entry,<sup>1,4-11</sup> and bar-coded medication administration systems.<sup>12,3</sup> The latest research assessing electronic health records (EHRs) shows that adoption rates are low,<sup>14-18</sup> quality of care is not improved with their use,<sup>19,20</sup> and costs are not reduced.<sup>21</sup>

Health IT systems sometimes do not achieve their full potential due to a lack of integration of the health IT into clinical workflow<sup>21</sup> in a way that supports the workflow among organizations (e.g., between a clinic and community pharmacy), within a clinic, and within a visit. For health IT to be effective, it needs to be integrated into the multiple levels of workflow that exist in ambulatory health care delivery. Results of empirical research also emphasize that health IT is not just technical content or technical design. Health IT also necessarily involves a workflow, so even the same system can have different results depending on the impact on workflow in the particular setting,<sup>23</sup> So one cannot extrapolate the success of one health IT system to another context (hospital care vs. ambulatory care), user (primary care physician vs. specialist), organization (solo clinic or large health maintenance organization), or set of features, as all might differently accommodate workflow.<sup>23</sup>

Unfortunately, little is known about workflow for care and administrative processes that can be used to guide decisions about where and how to integrate health IT.<sup>24</sup> The purpose of this contract is to develop a toolkit that health care organizations and decisionmakers can use to assess their workflows and determine when and how health IT may be used.

## Description of Agency for Healthcare Research and Quality (AHRQ) Contract

The contract was designed to “develop a practical and easy to use toolkit on workflow analysis and redesign that can be used by both small and large practices as well as other ambulatory settings in the selection and implementation of health IT to support practice redesign.”

Information was gathered for the toolkit by

- Conducting a literature and environmental scan of (1) current practice redesign efforts that use health IT as a tool, (2) health IT impact on clinical workflow, and (3) available workflow analysis and redesign methods and tools.
- Drafting a Federal Request for Information that AHRQ issued to obtain information regarding currently developed methods and tools or initiatives focusing on workflow analysis and redesign and how health IT can support workflow redesign.

The authors of this report will develop a toolkit on workflow analysis and redesign that provides a description of available tools and methods and a decision framework on how to determine when health IT can be used as part of practice redesign.

## **Objectives and Significance of the Request for Information**

A Request for Information (RFI) is a document issued by government agencies or businesses. As the title implies, the document serves to request information from the public in order to address or learn about a particular issue. The RFI is posted to the *Federal Register* and all public comments are voluntary.

The objectives of the RFI were to obtain information on:

- Developed methods and tools or initiatives for ambulatory workflow analysis and redesign.
- How health IT could support workflow redesign.

Relevant RFI responses will be incorporated into the toolkit as tools, methods, or user stories to inform the development of the toolkit.

## **RFI Development**

### **Structure of RFI**

The RFI was guided by three important frameworks: (1) human-automation interactions mostly, but not exclusively, outside of health care; (2) studies of teams, collaboration, and distributive work; and (3) sociotechnical systems research into health IT acceptance and use. All three contribute to an understanding of what health IT can be designed to accomplish and what it means to design and implement it effectively to achieve desired outcomes such as workflow integration. Several items were included to request information about workflow analysis and redesign tools used in the context of health IT design and implementation, including the advantages and disadvantages of the tool.

### **Procedure for Developing RFI**

The RFI primarily addressed two types of respondents: (1) small and medium-sized practices and (2) experts, vendors, and professional organizations that have developed, implemented, and used tools and methods for studying workflow in the context of health IT implementation and use. Small and medium-sized practices were asked to submit practice demographic information; type and functions of their health IT; details on tools, methods, technologies, or data reports used in workflow analysis or redesign; information regarding the impact of their health IT on the organization of work and workflow; and information regarding the implementation of their health IT. Experts, vendors, and professional organization respondents could submit details on tools, methods, technologies, or data reports used in workflow analysis or redesign.

To ensure that the components of the RFI could be easily understood by possible respondents, they were shared with two organizations: An outpatient surgery center and a large academic health care system that has ambulatory clinics. EHR implementation leaders at each of the two organizations thoughtfully provided feedback on the RFI. Their feedback was incorporated into the final RFI for AHRQ review and approval.

## **Posting to *Federal Register***

The final version of the RFI was approved by AHRQ and published in the *Federal Register* for 60 days. Once it was published in the *Federal Register*, the following organizations and Web sites received e-mail notification of the posting:

- AHRQ Web site.
- National Resource Center for Health IT Web site.
- Health IT GovDelivery list.
- Wisconsin Research and Education Network.
- American Academy of Pediatrics.
- Academic Pediatric Association.
- American Academy of Family Physicians.
- American Medical Informatics Association.
- American College of Physicians.
- Medical Group Management Association.
- Healthcare Information and Management Systems Society.
- American Osteopathic Association.
- American Medical Group Association.
- American Medical Association.

AHRQ accepted both electronic (submitted via e-mail) and nonelectronic responses. AHRQ forwarded all responses to our team. The final RFI is attached as an appendix.

## **Summary of Responses**

Thirty-two groups or individuals responded to the RFI. Responses came from rural and large medical centers, specialty clinics, research centers, professional organizations, companies, consulting groups, and individuals. Responses included inquiries, relevant and nonrelevant comments that did not directly address the RFI, partial or full responses to the RFI, and tool submissions. Team members reviewed the responses to determine relevance.

Responses to the RFI and relevant comments were inserted into the tables that follow. Most respondents did not comment on every RFI component and thus do not appear in every table. If respondents identified a vendor or software in their comments, this information was deidentified.

The tables that follow summarize responses submitted by the following organizations or associations:

- American Academy of Pediatrics.
- American Physical Therapy Association.
- Cooley Dickinson Hospital.
- Infosys Technologies, Ltd.
- Iowa Foundation for Medical Care.
- Marshfield Clinic Research Foundation.
- Massachusetts General Hospital (responded regarding two primary care practices and one specialty practice).
- MedTrak.
- Not identified, including responses from private practices.
- Perot Systems.
- United Physicians.
- UMass Memorial Health Care Children’s Medical Center.
- Westat.

## **RFI Responses**

Responses to the RFI are shown below. Responses regarding practice demographics are shown in Table 1, regarding health IT in Table 2, regarding workflow analysis and redesign tools in Table 3, regarding impact of health IT on the organization of work and workflow in Table 4, and regarding the impact of particular health IT applications on different domains of a practice or clinic in Table 5. Responses to the RFI that are not associated with specific RFI components are shown in Table 6.

Referenced and/or submitted tools that are relevant to the contract will be included in the toolkit and referenced in the final summary report for this contract. Table 7 shows RFI responses regarding tools.

## **Other Responses**

Many responses did not address the components of the RFI or AHRQ contract and were not included in this report. Examples include product marketing, political statements, inquiries with no response to followup, irrelevant suggestions, and information regarding large hospital implementations.

**Table 1. Request for Information responses: Practice demographics**

Response no.	Number of physicians and providers (physician assistants or nurse practitioners) in practice or clinic	Total number of staff (e.g., nurses, medical assistants, receptionists, educators) in practice or clinic	Number of patient visits practice or clinic had in 2008	Medical or surgical specialties within practice or clinic	Any ancillary services located onsite at practice or clinic <sup>a</sup>
#1	851	6,437	3,649,335		Radiology, lab, outpatient surgery, urgent care
#2	6	9	11,362	Pediatrics only	Only CLIA-waived testing done in office
#3	30				
#4	Over 100	In the hundreds.	About 75,000 patient visits	Primary care, urgent care, workers' compensation, occupational therapy, orthopedic surgery, chiropractic care	Lab, radiology, physical therapy, occupational therapy, dispensed medications
#5	Outpatient practice within the hospital—23	18	22,213	Psychiatry, nutrition	Lab, radiology, physical therapy, occupational therapy, pharmacy, speech therapy, phlebotomy
#6	Outpatient specialty practice within the hospital—11	15	15,640	No	Lab, radiology, physical therapy, occupational therapy, pharmacy, speech therapy, phlebotomy
#7	Practice within a health center—10	11	15,660	Internal medicine, family care, pediatrics	Lab, radiology, physical therapy, occupational therapy, pharmacy, speech therapy, phlebotomy
#8	2	4	Physician 1: 7,065 Physician 2: 5,300		CLIA-certified independent laboratory

<sup>a</sup>Examples include laboratory, radiology, physical therapy, occupational therapy, speech therapy, pharmacy.  
CLIA=Clinical Laboratory Improvement Amendments.

**Table 2. Request for Information responses: Health IT**

Response no.	Type of health IT	Setting in which health IT was used	Functionality of each health IT application	How long each health IT application has been in use
#1	EMR		Electronic health history, immunization and growth tracking, scanned/dictated progress notes, electronic prescribing, scanned in old medical record chart, electronic tasking (communication between our office staff, phone calls from patients), billing. I know this EMR has much more functionality than this, but our IT department has not rolled it out to us yet.	Since May 28, 2008
#2				5 years on one application; 1 year on the new application
#3			Scheduling, registration, EMR, CPOE, results tracking, referral tracking, surgery scheduling, billing, and collections.	For over 15 years
#4			EMR: Review and document patient visit notes; track, review, and communicate patient lab results; track primary care screening and immunizations; access provider medical education and patient teaching materials E-prescribing: Embedded within EMR; used to review and manage meds, write prescriptions, e-prescribe meds, refill meds, manage patient pharmacy list Digital imaging: Embedded within EMR; used to view patient radiographs, mammograms	EMR: 7 years E-prescribing: 3 years Digital imaging: 10 years

**Table 2. Request for Information responses: Health IT**

Response no.	Type of health IT	Setting in which health IT was used	Functionality of each health IT application	How long each health IT application has been in use
#5			<p>EMR: Review and document patient visit notes; track, review, and communicate patient lab results; scan patient tests performed within practice</p> <p>E-prescribing: Embedded within EMR; used to review and manage meds, write prescriptions, e-prescribe meds, refill meds, manage patient pharmacy list</p> <p>Digital imaging: Embedded within EMR; used to view patient radiographs, mammograms, etc.</p>	<p>EMR: 5+ years</p> <p>E-prescribing: 3 years</p> <p>Digital imaging: 5+ years</p>
#6			<p>EMR: Review and document patient visit notes; track, review, and communicate patient lab results; track primary care screening and immunizations; access provider medical education and patient teaching materials</p> <p>E-prescribing: Embedded within EMR; used to review and manage meds, write prescriptions, e-prescribe meds, refill meds, manage patient pharmacy list</p> <p>Digital imaging: Embedded within EMR; used to view patient radiographs, mammograms</p>	<p>EMR: 6 years</p> <p>E-prescribing: 3+ years</p> <p>Digital imaging: 5 years</p>
#7	EMR		<p>My office uses the integrated practice management, EMR with e-prescribing and billing software.</p>	

CPOE=computerized provider order entry. EMR=electronic medical record. IT=information technology.

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 1-3)**

		<b>Response #1</b>	<b>Response #2</b>	<b>Response #3</b>
<b>Workflow analysis and redesign tools</b>	<b>Name and acronym of tool</b>	Workflow editor: Enhydra JaWE, Fujitsu Interstage business studio, TIBCO business studio Workflow engine: Enhydra shark, Fujitsu Interstage engine Process mining: ProM tool Data reporting: Internally developed tools Database (Netezza): SQL-based analysis of event data, profiling of clinicians on which application and services within each application are used	Workflow analysis was done in a basic form before implementation by a consultant from our IT department. They basically just looked at flow they knew would be directly impacted – i.e., patient registration to rooming, call processing... We were able to sit down with them and review somewhat the new workflow. I don't know if/what tool they used.	Medical Office Survey on Patient Safety Culture
	<b>Authors, sources, and/or references</b>			Developed by Westat and sponsored by AHRQ
	<b>Background about tool, method</b>			
	<b>Intended purpose: i.e., what it was</b>			A tool that medical offices can use to assess patient safety culture and quality issues, information exchange with other settings, office processes and standardization, communication openness, work pressure and pace, and other dimensions of their medical office's patient safety culture, both before and after health IT implementation.
	<b>How tool, method, technology, or data report was used</b>			The Medical Office SOPS is designed specifically for outpatient medical office providers and staff and asks for their opinions about the culture of patient safety and health care quality in their medical office. The survey can be used: *As a diagnostic tool to assess the status of patient safety culture in a medical office. *As an intervention to raise staff awareness about patient safety and health care quality issues. *As a mechanism to evaluate the impact of patient safety improvement initiatives. *As a way to track changes in patient safety culture over time.
	<b>Resources needed to use tool</b>			

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 1-3)**

	Response #1	Response #2	Response #3
<b>Information about reliability and validity</b>			The Medical Office SOPS survey was developed using a rigorous scientific process, including a literature review, expert consultation, pretesting (cognitive testing) of survey items, and pilot survey administration in 182 U.S. medical offices with more than 4,000 respondents. Psychometric analyses were conducted on the pilot survey data, including item analysis, factor analysis, reliability analysis, and multilevel confirmatory factor analysis. The Medical Office SOPS survey has 52 items measuring 12 patient safety culture dimensions, which all have sound psychometric properties.
<b>Advantages/disadvantages</b>			While Medical Office SOPS can be conducted in any size medical office, it is recommended that survey administration be restricted to medical offices with at least three providers—i.e., physicians (M.D. or D.O.), physician assistants, nurse practitioners, and other providers licensed to diagnose medical problems, treat patients, and prescribe medications. Solo practitioners or offices with only two providers are so small that conducting a survey is probably not an effective way to obtain staff opinions about patient safety culture. Staff in small offices will not feel that their answers are anonymous and may not be willing to complete the survey or answer honestly. It is also recommended that there be at least five respondents in an office before feedback reports are created, to protect anonymity. Therefore, offices have to survey more than five providers and staff because it is unlikely that all of them will respond to the survey. In small offices, rather than administering the survey, they can use the survey as a tool to initiate open dialog or discussion about patient safety and quality issues among providers and staff. The Medical Office Survey on Patient Safety Culture was designed to be appropriate for medical offices of any medical specialty—e.g., medical offices providing primary care services only, other specialty care services only, or a mix of primary and specialty care services.
<b>Overall usefulness of tool</b>			
<b>Ease or difficulty of use of tool</b>			It is easy to use, usually administered by paper and pencil, takes about 15 minutes to complete, and is written for about a 10th-grade reading level.

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 1-3)**

		Response #1	Response #2	Response #3
	<b>Additional information to assist our target audience to avoid pitfalls of complicated or inappropriate tools and software</b>	<p>Each development has a physician sponsor who oversees the development of every new functionality</p> <p>Identified pitfalls:</p> <ul style="list-style-type: none"> <li>*Vendor differences in implementing XPDL, a standard workflow definition language</li> <li>*Clinician-friendliness of resulting flowcharts (complex processes benefit from using hierarchical process arrangement)</li> <li>*Use of subflows</li> <li>*Event listener for EHR events</li> <li>*Must be supported well by the EHR system</li> </ul>		<p>A Data Entry and Analysis Tool that works with Microsoft® Excel is also available to medical offices and makes it very easy for them to:</p> <ul style="list-style-type: none"> <li>*Input their individual-level data from the survey.</li> <li>*Create graphs and tables to display their survey results overall and by various demographics.</li> <li>*Analyze which patient safety culture dimensions may need additional attention.</li> <li>*Compare their results against comparative data available from other facilities.</li> <li>*Share the results with others in their organization.</li> </ul> <p>The Medical Office SOPS survey must have been administered in its original, unmodified form to use this tool. The tool is available by request by sending an e-mail to: <a href="mailto:databasesonsafetyculture@ahrq.hhs.gov">databasesonsafetyculture@ahrq.hhs.gov</a>. AHRQ's support contractor for the SOPS surveys, Westat, is available to provide technical assistance to medical offices in matters pertaining to survey administration and use of the Data Entry and Analysis Tool. For general technical assistance, users should e-mail <a href="mailto:safetyculturesurveys@ahrq.hhs.gov">safetyculturesurveys@ahrq.hhs.gov</a> or call 1-888-324-9749. For technical assistance with the Data Entry and Analysis Tool, users should e-mail <a href="mailto:databasesonsafetyculture@ahrq.hhs.gov">databasesonsafetyculture@ahrq.hhs.gov</a> or call 1-888-324-9790.</p>

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 4-6)**

		Response #4	Response #5	Response #6
<b>Workflow analysis and redesign tools</b>	<b>Name and acronym of tool</b>	<p><i>Note: not all tools are publicly available</i></p> <p>The AAP has several resources that <b>our members</b> can use to help them select an EHR for their practice. These include:</p> <ul style="list-style-type: none"> <li>*A Toolkit on "Implementing an EHR," which is available through our Practice Management Online Web site (<a href="http://practice.aap.org">http://practice.aap.org</a>).</li> <li>*A clinical report, "Special Requirements for Electronic Health Record Systems in Pediatrics." (<a href="http://aappolicy.aappublications.org/cgi/reprint/pediatrics;119/3/631.pdf">http://aappolicy.aappublications.org/cgi/reprint/pediatrics;119/3/631.pdf</a>).</li> <li>*A Web site, <a href="http://www.aapcocit.org/emr">www.aapcocit.org/emr</a>, where members can rate how well their EHRs perform on specific pediatric functions and share their experiences with their peers.</li> <li>*Membership in the AAP Council on Clinical Information Technology and Section on Administration and Practice Management, through which members hold frequent e-mail discussions about their experiences in implementing health IT.</li> <li>*A "Pediatric Documentation Challenge" event at our annual National Conference &amp; Exhibition, in which 8-10 EHR vendors each demonstrate how their systems document a single, pediatric specific office encounter.</li> </ul>	<p>Process Mapping Guidelines Operational Redesign Through Workflow Analysis Operational Redesign: Patient Flow Operational Redesign: RX Refill or Renewal Operational Redesign: Scheduling Best Practice Considerations: Patient Visit Best Practice Considerations: Labs Best Practice Considerations: Documents Point of Care Documentation her in the Exam Room Workflow Assessment</p>	<p>How To Guide for Current State Future State Process Redesign Activity</p> <p>Guide for Using VISIO To Document PRD Workflows</p>

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 4-6)**

		Response #4	Response #5	Response #6
	Authors, sources, and/or references		Tools were submitted by IFMC	Presentations submitted by Perot Systems Healthcare Consulting
	Background about tool, method			
	Intended purpose; i.e., what it was		<p><b>Process Mapping Guidelines</b>—This simple educational tool shows the practice how to look at a current process, identify complexities and areas of waste. It also gives suggestions for things to consider when determining how the current process can change with EHR implementation.</p> <p><b>Operational Redesign Through Workflow Analysis</b>—This workbook is a guide to assist a practice in examining their current office processes and looking for areas to improve or change with EHR implementation. The guide addresses four key areas of operational redesign: patient flow, point-of-care documentation, in-office communication, and document management. Each section assists the practice with analysis of the current process, identifying their vision and goals for the future process, and giving best-practice examples.</p> <p><b>Operational Redesign: Patient Flow, Operational Redesign: RX Refill or Renewal., Operational Redesign: Scheduling</b>—These three templates help guide a practice through documentation of their current workflow with information about the same steps with an EHR and best-practice information.</p> <p><b>Best Practice Considerations: Patient Visit, Best Practice Considerations: Labs, Best Practice Considerations: Documents</b>—These three documents list best-practice recommendations and address how the EHR will change current workflow and the steps needed to ensure success with these changes.</p> <p><b>Point of Care Documentation</b>—This tool assists a practice to identify and analyze the documentation processes that exist and determine what steps are needed to transition from paper to electronic documentation.</p> <p><b>EHR in the Exam Room</b>—This document</p>	

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 4-6)**

		Response #4	Response #5	Response #6
			identifies five key communication behaviors to integrate the computer into the exam room interaction with the patient. <b>Workflow Assessment</b> —This tool was completed by the practice and shared with the vendor implementation team. This helped the team to identify and map the vendor recommendation for the most efficient workflows.	
	How tool, method, technology, or data report was used			
	Resources needed to use tool			
	Information about reliability and validity			
	Advantages/disadvantages			
	Overall usefulness of tool			
	Ease or difficulty of use of tool			
	Additional information to assist our target audience to avoid pitfalls of complicated or inappropriate tools and software		IFMC has worked with physician offices to assist them with electronic health record planning, selection, and implementation. We utilized a number of tools that were developed by QIO's specifically for this work in the 8th SOW. The knowledge level regarding workflow analysis, process mapping, and process redesign within this setting varies greatly. Our experience is that most of the small and medium-sized practices do not have internal resources to assist them with implementation of health information technology. The attached tools were utilized by our project participants as we worked with care process workflows.	

Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 7-8)

		Response #7	Response #8
Workflow analysis and redesign tools	<b>Name and acronym of tool</b>	MedTrak	As-is process mapping Process standardization To-be process definition Process execution-----
	<b>Authors, sources, and/or references</b>	Designed, programmed, and served over the Internet by MedTrak	Document referencing above tools submitted by Infosys Technologies Ltd.
	<b>Background about tool, method</b>	See Chapter 1 of MedTrak Medical Clinic Workflow book included with this response. This book is being used by a midwestern university to train hundreds of medical assistants, billers, and health information technology students each semester both in the seated classroom and online.	<p><b>As-is process mapping</b>—Business process redesign (BPR) will involve significant participation from physician practice staff. The team should be led by a business process management expert, and basic business process redesign tools and techniques training need to be provided to the staff. It's important at this stage to engage with the management team to understand what the vision of the physician practice is, as BPR has to be in complete alignment with practice's vision and goals.</p> <p><b>Process standardization</b>—As a part of the user adoption strategy, it is important to identify user groups (physicians, nurses, administrative staff etc.) whose work will be impacted by the process change. Apart from involving them in the process design, one should simultaneously start a change management campaign that will prepare users for the changes to come. Communicating the vision, objectives, expected benefits, and a work plan to enable users to adopt new processes should be the first step, followed by regular communication on the progress.</p> <p><b>To-be process definition</b>—It is essential to create a to-be process definition guideline to ensure consistency in process definitions and approaches. Determine the desired process characteristics (task sequence, end results, performance indicators, level of automation, user group, etc.) and decide whether this process should be abandoned, outsourced, left as is, redesigned or improved. The BPR team should have closed-door ideation sessions to generate and assess new ideas.</p> <p>Ideas can also be borrowed from previous successful IT implementations, recommendations from standards-defining bodies and industry best practices.</p> <p><b>Process execution</b>—This stage is a link between BPR and IT implementation.</p>
	<b>Intended purpose: i.e., what it was</b>	Used during the whole implementation and current business process.	
	<b>How tool, method, technology, or data report was used</b>	MedTrak is used to run every aspect of the clinical and business process of the medical facility with everyone participating, from physicians to clerical staff.	<p><b>As-is process mapping</b>—Create a process inventory and swim-lane diagrams for the processes to be impacted by IT implementation. BPM modelers available from various technology vendors can be leveraged for as-is process mapping. Swim-lane diagrams are developed with increasing level of details, starting with handoff, then flow model, and if required, task-level model. Identify leverage points for key processes. Acquire a good understanding of process enablers (staff, policies, motivation, information technology, core competencies, etc.) as well as the factors that constrain the process. Collect available data on the performance benchmarks for these processes.</p>

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 7-8)**

		Response #7	Response #8
			<p><b>Process standardization</b>—In this step, the as-is manual and legacy IT systems processes are measured against the best practices to identify impediments, opportunities, bottlenecks, lack of compliance, and operational and IT problems, thereby identifying processes for optimization. Process controls and performance indicators are identified for the processes, and target values for performance indicators are set based on available industry benchmarks. Interdependencies and interrelationships of processes are also identified and analyzed to understand their impact on process design as well as IT system implementation. It is very likely that different physician practices in the same network may have distinct implementation of common processes. BPR team analyzes and discusses these discrete process flavors to come up with a high-level straw man of a converged and streamlined common process that can address needs of most of the clinics and is aligned with best practices. More than one converged-process straw man can be developed and analyzed.</p> <p><b>To-be process definition</b>—Construct conceptual models of new operational activities for each relevant organizational unit following the prioritization scheme. Straw-man models will be workflow based and enriched with the relevant business rules. If the IT system to be implemented has been selected, the models should be aligned with IT system, and configuration constraints of the system will influence to-be model design. Apart from the straw man for the main process flow, it is important to model all the alternate process paths and exceptions. Stakeholder feedback will be used to address problems, impediments, and inefficiencies as well as to describe the desired outcome. Infrastructure and environmental needs for the processes should be identified. The conceptual data model developed during the as-is process definition phase should be revised in light of process changes. Information flow paths must be clearly defined, highlighting data gathering, cleansing, storage, retrieval, and consumption processes.</p> <p><b>Process execution</b>—In this stage, based on to-be process definitions, process scenarios are created. Also, for IT-driven process components, use cases are identified and created. These use cases can be used to build a custom application or can be used to evaluate product solutions available in the market. They can also be leveraged to define configuration specifications for the selected IT package. By now, we should have sufficient information to create a logical data model and define information architecture. The information flow model involving data collection, cleansing, and access is refined. Job cards should be created that describe all the processes from a particular user’s perspective. These can be used for user training.</p>
	<b>Resources needed to use tool,</b>	MedTrak is accessed and used over the Internet with fixed terminals and wireless touch-screen tablets with voice recognition.	
	<b>Information about reliability and validity</b>	MedTrak is a stable and proven clinical workflow system having processed millions of patient visits.	
	<b>Advantages/disadvantages</b>	MedTrak automates every aspect of the clinical and billing processes for a medical facility, thus enabling the clinical and billing staffs to have maximum workflow advantages with minimal effort.	

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 7-8)**

	<b>Response #7</b>	<b>Response #8</b>
<b>Overall usefulness of tool,</b>	MedTrak is very useful for everyone in the medical facility.	
<b>Ease or difficulty of use of tool</b>	Based on comments from MedTrak users, MedTrak is easy to use because it mirrors the most efficient workflow for the medical facility.	
<b>Additional information to assist our target audience to avoid pitfalls of complicated or inappropriate tools and software</b>	MedTrak believes that workflow should solve the whole problem, not just pieces.	

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 9-10)**

	Response #9	Response #10	
<b>Workflow analysis and redesign tools</b>	<b>Name and acronym of tool</b>	Workflow diagram, flow chart, process map, process flow	Time study, day in a life
	<b>Authors, sources, and/or references</b>		Most studies point to Frederick Taylor as the original author of time studies. One can review <i>The Principles of Scientific Management</i> by Taylor.
	<b>Background about the tool, method</b>	Workflow diagrams are standard technique for describing a particular process and have been in used for decades in wide area of applications. In particular Lean methodology utilizes workflow diagrams as the basis for its value-stream mapping tool.	Time study is a standard technique for measuring the performance of particular workflow. It has been in use for decades in a wide array of environments.
	<b>Intended purpose: i.e., what it was</b>	Workflow diagrams, or flowcharts, are used to describe a process or workflow using pictures or shapes arranged in sequence by a series of lined arrows or connectors. In a simple workflow diagram, each shape or picture represents a specific step in a process. Each step or shape in the workflow is joined by use of a line or connector. Workflow diagrams' intended purpose is to be a tool to help distinguish between efficient steps in the process and nonefficient steps in the process. These diagrams are used to chart the macro-level flow of specific processes within the practice in a manner where the focus is placed on the process rather than on the person performing the process. Workflow diagrams allow one to look at a process more objectively. They allow an understanding of how steps are interrelated within the process and enable better problem identification within the process. Finally, this tool allows one to simulate or project a particular process without necessarily committing significant design/development resources.	*Time study is a basic observation tool in which an analyst will observe a particular workflow and keep a record of how much time is spent in each step of the process. *The study's main purpose is to measure the amount of time needed to perform each step in a given workflow. Additionally, if a time study is performed on the same workflow repeatedly, the study may provide a measurement of variability in the workflow.
	<b>How tool, method, technology, or data report was used</b>	Workflow analysts observed the patient flow and charted the process from patient check-in to check-out. The process map was validated with practice staff involved in the process. The analysts facilitated the identification of wastes (non-value-added steps) within the process by the staff. The findings from this and other tools were used to identify areas which can be improved with the use of available clinical information systems.	Time study analysis was done to find out how much time is spent in various tasks by the staff members. This analysis gives objective data and enables one to identify time distribution in tasks, how much time is wasted performing certain tasks (such as time spent walking or waiting), and tasks requiring the most time. The workflow analyst records the time spent by the staff member doing various tasks and computes the information graphically for analysis. The information is shared with the practice staff to identify opportunities to reduce wasted time of the observed staff member.
	<b>Resources needed to use tool</b>	Expertise: Understanding of guidelines of charting a process map. Expertise level=basic. Time: 2-3 hours Software: None required	Expertise: Experience and a moderate level of expertise are needed Time: 2-4 hours Software: Stopwatch and notepad; however, specialized time study software can also be used

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 9-10)**

	Response #9	Response #10
<b>Information about reliability and validity</b>	In general, workflow diagrams depend on the validity of the data being used to construct the diagram. For example, if the information used to construct the diagram is based on user interviews, then the diagram is only as reliable as the fidelity of such interviews in representing the actual process.	*Reliability of time studies typically depends on both the training and capacity of the analyst observer to make valid time measurement observations. *Reliability of time studies also depends on the ability of the observed event, or series of events, to be representative of the workflow being studied.
<b>Advantages/ disadvantages</b>	<p>Advantages: *Easily represent potentially complex processes in an easy-to-understand format. *Provides a relatively simple medium to both identify areas of inefficiency in a process as well as project how new improvement opportunities may impact the overall existing workflow</p> <p>Disadvantages:*Workflow diagrams are only as good as the information used to create them. Hence if a diagram was created from an interview or observation exercise, then the diagram will only be as good as the ability for such exercises to be representative of the actual process to be diagramed. *Typical workflow diagrams are limited in their capacity to diagram variability in workflow. Therefore, workflow diagrams are best used in conjunction with other tools that can better represent workflow variability.</p>	<p>Advantages: The main advantage of time study is that it can measure the amount of time a user spends performing a given step in a workflow. One common criticism employed by EMR users is that usage of some EMR functionalities takes much longer than anticipated. A time study allows validation of such a claim. Moreover, if in fact usage of the EMR functionality is measured as taking longer than anticipated, then EMR support personnel could potentially analyze such observations. This analysis could lead the EMR support personnel to engineer new workflows that could better leverage EMR functionality and accomplish the measured workflow in less time than previously thought.</p> <p>Disadvantages: *The most typical disadvantage is what the literature calls the “Hawthorne effect,” which essentially says that subjects being observed will act differently than normal in that they know they are being observed. This would be true in a standard time study observation where an observer would shadow a clinician performing an activity. This clinician would act a bit differently knowing that he or she was being observed. *Time studies are very difficult to perform on large-scale engagements. Studies of this kind are resource intensive since they require a time study analyst to “shadow” or observe the process for long periods. In addition, time study measurements must then be analyzed and categorized for the study to have any meaning. Overall, this makes such a study resource intensive and it can become difficult to scale.</p>
<b>Overall usefulness of tool</b>	Workflow diagrams are a very useful tool to share and work with clinicians. Many process inefficiencies can easily be identified using workflow diagrams in a manner that can be easily shared with a group of clinicians.	Time study tools are very useful tools since time is the main focus of the study. For EMR implementations, “time” can be a very effective agent to promote change. In essence the analyst team can leverage an argument like “EMR Workflow ‘A’ takes less time to support than traditional workflow ‘B’” to encourage change around a particular concept.
<b>Ease or difficulty of use of tool</b>	Basic, essential tool which is fairly easy to use.	It is of moderate difficulty to use. The observer needs practice and experience

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 9-10)**

		Response #9	Response #10
	<p><b>Additional information to assist our target audience to avoid pitfalls of complicated or inappropriate tools and software</b></p>	<p>Clinical workflows typically vary greatly from clinician to clinician. Therefore, care must be taken when using workflow diagrams. In our experience, we typically use workflow diagrams in addition to other process-improvement tools that could better describe the variability of a particular step or group of steps in a given workflow. For example, a workflow diagram may be used to describe how a group of physicians typically completes patient encounter notes. In addition, a task-time analysis may be used in conjunction with the time study to better describe how much time each physician may spend documenting the note.</p>	<p>One pitfall to avoid is to not provide adequate training and tools for observers to do an effective job. Many clinical tasks are accomplished very quickly, and this can make it difficult to document and measure the amount of time it takes to perform a task. Trained observers using specialized observation tools can better make time study observations and subsequent analyses.</p>

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 11-12)**

		<b>Response #11</b>	<b>Response #12</b>
<b>Workflow analysis and redesign tools</b>	<b>Name and acronym of tool</b>	Spaghetti map, spaghetti diagram	[Tools provided by a vendor] include production analysis by facility, RVU, CPT, practice management reports, registry, integrated clearinghouse reports. Clinical tools include lab flow sheets, OB flow sheets, CDSS/Order Sets, PQRI, integrated Up-to-Date [an evidence based information resource], and Code Correct [billing and coding software]. I'm not sure what is meant by task analysis. The only one I routinely use is the elapsed time for patient visits (end-to-end as well as face-to-face with provider).
	<b>Authors, sources, and/or references</b>		
	<b>Background about tool, method</b>	Motion study is a standard tool utilized to describe physical movement from a given workflow. These tools have been in used for decades in a wide area of applications and industry.	
	<b>Intended purpose: i.e., what it was</b>	Motion study's purpose is to diagram physical movement of a particular workflow in hopes of highlighting areas of efficiency and inefficiency.	
	<b>How tool, method, technology, or data report was used</b>	It was used in conjunction with a process map to capture the physical and spatial elements that impact the process. A floor plan of the area was developed, and motion study was undertaken to understand how the process flow is impacted by the layout and to expose large distances traveled between steps within a process. Workflow analysts observed "typical" patient flow and translated the observation notes into lines on the floor plan. The distance traveled by each staff member in the process was computed and the distance traveled determined.	
	<b>Resources needed to use tool,</b>	Expertise: Moderate Time: 1 hour Software: Measuring wheel, floor plan (layout)	
	<b>Information about reliability and validity</b>	In general, motion studies, or "spaghetti diagrams," depend on the validity of the data being used to construct the diagram. For example, if the information used to construct the diagram is based on user observation, then the diagram is only as reliable as the fidelity of such observation in representing the actual process.	

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 11-12)**

		Response #11	Response #12
	<b>Advantages/disadvantages</b>	<p>Advantages:                      The main advantage of a motion study is that it has the potential of highlighting multiple areas of inefficiencies that can be improved upon by introduction of information systems. In the context of health care, much of the physical movement observed in workflows is directly related to the communication of clinical information. By careful selection and introduction of specific information systems, one can reduce the amount of travel exhibited in the study. The motion study can effectively showcase areas of inefficiency as well as provide a testing area for new workflows.</p> <p>Disadvantages:                      Motion studies are also susceptible to variability, meaning that different physical movements or paths may be taken, depending on the patient or clinician at hand. Performing multiple observations may provide some control by better accounting for this variability.                      Hawthorne effect may play a part here, too, but will not have as profound an effect as in the other tools.</p>	
	<b>Overall usefulness of tool</b>	<p>*Motion studies are very useful in demonstrating inefficiencies in physical movement, plus highlighting opportunities for better usage of the EMR and other related information systems.</p> <p>*Motion studies are best used in combination with other studies like workflow diagrams or time studies to better provide a more complete picture of a particular workflow.</p>	
	<b>Ease or difficulty of use of tool</b>	Fairly straightforward to use and chart. The analysis needs to be properly correlated with the other findings from other tools.	

**Table 3. Request for Information responses: Workflow analysis and redesign tools (Responses 11-12)**

		Response #11	Response #12
	<p><b>Additional information to assist our target audience to avoid pitfalls of complicated or inappropriate tools and software</b></p>	<p>Want to make sure that the workflows being diagramed in the motion study are in fact representative of the actual workflow. Physical movement in health care can be highly variable, so one should strive to account for this variability.</p>	<p>When we adopted our EMR in 4/07, we fell into all the pitfalls possible. In retrospect, here's what we could have done differently:</p> <ul style="list-style-type: none"> <li>*Believe the salesman? Don't have unrealistic expectations.</li> <li>*Computer literacy? Knowing how to access the Internet is not enough. We should have taken a basic Windows computer class before we started. One M.D. is very gadget oriented; the other is 68 years old and barely types.</li> <li>*Set aside dedicated time for training. Although we curtailed office hours, there was just too much to absorb to try to maintain a reasonable schedule for almost a month after "going live."</li> <li>*Fortunately, we chose a flexible EMR because the provider specialties seemed to be so different. Ultimately, we discovered that all medicine is more similar than different. Although the internist does not use the operative note, the surgeon routinely uses the medical progress note. Both use the same CPT, ICD, prescribing functions, ordering functions, document files, etc., in the same way.</li> <li>*From the reseller viewpoint: Spend the money on a good networking infrastructure and adequate hardware. As our providers became more proficient, they wanted faster machines. They wanted to work from home or their iPhones, something they did not envision at the onset.</li> </ul>

AAP=American Academy of Pediatrics. AHRQ=Agency for Healthcare Research and Quality. CDSS=clinical decision support system. CPT=Current Procedural Terminology. DO=doctor of osteopathy. EHR= electronic health record. EMR=electronic medical record. ICD=International Classification of Diseases. IFMC=Iowa Foundation for Medical Care. IT=information technology. PQRI=Physician Quality Reporting Initiative. QIO=Quality Improvement Organization. RVU=relative value unit. SOPS=Survey on Patient Safety Culture. SOW=statement of work. SQL=structured query language.

**Table 4. Request for Information responses: Impact of health IT on organization of work and workflow**

	Support available during health IT implementation	Training provided to users and methods used to train	Successful or unsuccessful interfacing of the health IT application with other applications	Any formal evaluation of health IT implementation	
#1	Marshfield	Any well-designed workflows (sequence and coordination of EHR system components use) are better accepted by users and provide the desired benefit.	Marshfield can share EHR data with other health care organizations.		
#2	During implementation, provider appointment times were doubled for a week, then up 50% for 2 weeks. We have ongoing phone and e-mail access to EMR specialists and 24/7 access to computer techs for when the myriad of equipment that had to be installed malfunctions.	Three different training sessions were given based on functionality that a given staff member would be using. Took approximately 1 full day of time for hands-on, out-of-office training for any given staff member.  We had two to three trainers onsite for 2 weeks, including a billing specialist.	Interfaces well with our health care systems' scheduling and laboratory/diagnostic imaging applications. Trying to get IT to hook us into another health care systems health IT system	No formal evaluation yet that I am aware of.	
#3			We have a community-wide electronic record. Our record interfaces with it for labs and if I get a referral from an outside local provider, I can access labs and notes.		
#4	Pediatric practices take different approaches to handling the difficult initial "go-live" period. Some AAP members limit patient visits during training and in the initial weeks after going live with the new technology. Many small and medium-sized practices are concerned about the impact on revenue if their patient loads decrease, even for a brief time. Some choose to run parallel paper and electronic systems for a short time. This allows the practice to begin using the EHR slowly, perhaps with only one to two patients per day, and slowly increase its use. Once they are documenting only in the EHR, they can begin	Health information technology vendors typically offer a variety of training options, ranging from off-site training at the company's headquarters, to on-site training at the practice, to Web and teleconference training. Many practices are tempted to base the amount and type of training solely on its cost. However, the AAP recommends that practices invest in as much upfront training as feasible in order to avoid costly setbacks after going live with the new technology. As one member noted, "You can pay for it now, or pay for it later." In a solo or small group	Medium-sized practices may choose to train "super users," who then train the rest of the staff. It will be important for everyone in the practice to have some advanced training and feel somewhat comfortable with the new system before the launch. One member reported, "I was "on call" the day we went live, and the EMR conversion team was only able to help me hands-on with ONE patient. This is all the hands-on training I had. The biggest problem was that, of the four-member training team sent by [the vendor], only ONE knew the product well enough to train us. About 2 months after the conversion, when everyone was drowning, we had to	Pediatricians who implement an EHR find they need a set of interfaces in order to exchange data with other health information technology applications and organizations. Such interfaces might include: *Auxiliary systems to generate recall reminders to encourage health maintenance and manage chronic conditions. *Translation of electronic patient data from an old EHR or practice management system. *Immunization and chronic disease registries. *Laboratory systems .While invaluable in improving practice efficiency, such	Direct evaluation of a health IT implementation using concrete measures can be difficult in small to medium-sized pediatric practices. Measures may include: *Increased revenue through more accurate billing. *Improved patient satisfaction. *Elimination of drug errors and interactions. *-Improved quality of care based on measures such as immunization rates. *Improved chronic care management, including the development of disease registries. *Office efficiency as measured by the ability of providers to

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	to phase out the paper records. In addition, it may be helpful to have an individual with knowledge of computer systems on-site for the initial rollout to handle any "glitches" that may arise.	practice, the amount and type of training may be based on the level of expertise of existing staff and providers. One member, who considers himself a "computer geek," was comfortable relying on his vendor's Web-based training modules, which he could complete as his own pace when time permitted. Another member opted for 2 days of training at the vendor's headquarters, followed by 1½ days of on-site training for his staff. The practice then took advantage of Web meetings with their vendor's support staff for 2 weeks after go-live.	pay to fly our favorite company consultant down, and then pay \$180/hour for her to work with each of the MDs to help them customize." Once the practice is comfortable using the EHR's basic features, more advanced features can be introduced. One member notes that, in her practice, one person begins using a new feature, gets comfortable with it, and then teaches the feature to the rest of the practice.	interfaces can be costly to develop and may require an extensive amount of time to set up, test, and implement. According to one member, "We have had to expend unbelievable amounts of time and effort to figure this process out, and have had to hire additional lab help so that our lab director can put full-time effort into this ongoing conversion."	complete all charting responsibilities and leave the office on time. *Staff efficiency through reduction or elimination of time spent pulling charts and entering billing charges. *Office efficiency through enhanced intra-office communication. *Improved patient/family satisfaction.
#5	MedTrak provided training for everyone in the medical facility, then MedTrak provided go-live support during the startup period, and continuous 24-hour ongoing support. The medical facility did not incur any overtime during training or after go-live.	MedTrak provides 2 hours of hands-on training for each employee, including the physicians. Additionally, MedTrak provides online training classes. MedTrak suggests that each facility develop super users for after go-live immediate support and new employee training. After go-live, because MedTrak is easy to learn and easy to use, new employees learn on the job by watching existing users. MedTrak has never been asked to do additional training at an existing user location.		MedTrak has successfully integrated with lab systems, hospital MPI systems, external billing systems, clearinghouses using custom and HL7 interfaces.	MedTrak is not aware of any formal evaluations of its product, but MedTrak continually asks its clients for feedback and suggestions for improving its product. Because MedTrak is served over the Internet, improvements to MedTrak have been on a continual basis with no need for clients to install a new version of the software.
#6	The implementation of EMR is handled by an EMR analyst assigned to a practice. This person trains the staff in the EMR, troubleshoots problems with the EMR, optimizes functionalities of the EMR (e.g., creating a favorite medication list, creating note template), and acts as a liaison to triage any issues related to the EMR. Once a practice has gone	All the practice staff using the EMR are trained – MD, NP, nurses, receptionist, secretaries, educators, etc. Initial 4-hour training to the providers and 2 hours to other staff is recommended. This occurs in person during the 2-week implementation period. The EMR analyst is also available for on-site visits. Hence small-group or individual	Additional resources and time: With the adoption of an electronic clinical system such as the EMR, there is a learning curve; therefore, initially the staff spends more time to complete tasks. Over time, this time gradually reduces and levels off. Having said that, the users feel that it takes longer to document information in EMR than on paper charts. The reasons for this are varied and beyond the scope of	The EMR has an interface with the lab system; hence test results are available in the EMR. There is no interface to order the lab tests electronically. Interfaces are also in place with the scheduling system. As users get comfortable with the IT applications, they have shown interest and desire for interfaces with practice-specific systems to enable them to work	For a successful EMR implementation, support from practice leadership is essential and key. Availability of the right resources ensures a smooth implementation. No formal methods are currently in use to measure the success of EMR implementation. However, the "MR workflow efficiency program" mentioned above utilizes a number of

**Table 4. Request for Information responses: Impact of health IT on organization of work and workflow**

	Support available during health IT implementation	Training provided to users and methods used to train		Successful or unsuccessful interfacing of the health IT application with other applications	Any formal evaluation of health IT implementation
	<p>through the initial EMR implementation, the practice can enroll in an "EMR workflow efficiency program." This program, which runs anywhere from 8 to 16 weeks, is one where a team of workflow analysts collaborates with practice staff to efficiently utilize the EMR and other clinical information systems. The tools mentioned in this RFI are some of the tools used in the program.</p>	<p>training sessions occur at regular intervals. General classroom and computer training sessions are available for all staff. In addition, as a part of the "EMR workflow efficiency program," a detailed audit is performed for each provider using the EMR that pinpoints to user-specific training needs and enables creation of an EMR training curriculum to address the observed knowledge gaps.</p>	<p>this discussion. Having said this, one of the key areas that the "EMR workflow efficiency program" focuses on is reducing the amount of time required to perform specific clinical documentation tasks. By reducing this time, one not only improves efficiency; but also encourages better EMR adoption. To support chart conversion process during the transition from paper charts to the electronic system, practices have either taken the support of their medical records personnel or hired temp staff. As more documentation needs to occur in the EMRs, such as maintaining problem lists and reconciling medications, practices have had to look at staff utilization and properly assigning them to accomplish these tasks.</p>	<p>more efficiently.</p>	<p>measures to define success of its program. In general it relies on two sets of measures: EMR satisfaction and EMR workflow efficiency. Satisfaction in the EMR is measured by an EMR satisfaction survey to all practice users before and after the program. EMR workflow efficiency is measured by pre- and post-workflow analysis, based on some of the tools mentioned in this RFI, where detailed improvements in time, resources, or quality can be calculated.</p>
#7		<p>*A year after our miserable implementation, I went to work for the EMR reseller. I changed the implementation schedule to balance training vs. income. The standard plan was 1 week of dedicated, intensive training followed with sporadic site visits and telephone followup. The schedule we now use has been well received and has resulted in fewer frantic support calls in the immediate post-adoption period. *We start with a half-day general overview for all staff. This gets them started building their databases of referring physicians,</p>	<p>*Week 3: Four half-day training sessions. *Week 4: Four half-day training sessions for specific users (providers, billers). This is followed with two on-site visits/week for 1 month and gradually tapered over 4 months to transition the clients to remote/telephone support and troubleshooting. We could not do this without the subsidy offered by our local IPA. [Vendor deidentified] offers free Webinars and Question &amp; Answer sessions, although we are not in a convenient time zone. I personally use the [vendor deidentified] user forums to find solutions.</p>	<p>We have had unusual success achieving laboratory interfacing with our two dominant local laboratories. However, because lab margins are thin, neither lab company is moving too quickly toward national standards, like LOINC codes. We do not have radiology interfaces, despite our best efforts. They cite cost as a factor. Device integration (EKGs, spirometers, vitals machines) is great. Clearinghouse integration is great. We use [network deidentified] for e-prescribing but many pharmacies cannot or do not know how to respond. I am currently working on this....</p>	

**Table 4. Request for Information responses: Impact of health IT on organization of work and workflow**

	Support available during health IT implementation	Training provided to users and methods used to train	Successful or unsuccessful interfacing of the health IT application with other applications	Any formal evaluation of health IT implementation
		pharmacies, insurance companies, etc. and entering patient demographic information (assuming they opted out of data migration) for the week ahead. *Week 2: Half day to review progress with file building. Introduce features that will be used by all staff (e.g., messaging, document management).		

AAP=American Academy of Pediatrics. EHR=electronic health record. EMR=electronic medical record. HL7=Health Level Seven International. IPA=independent practice association. IT=information technology. LOINC=Logical Observation Identifiers Names and Codes. MPI=master patient index. NP=nurse practitioner. RFI=Request for Information.

**Table 5. Request for Information responses: Impact of particular health IT applications on different domains of a practice or clinic**

	Communication among practice or clinic staff	Coordination of care among practice or clinic staff	Information flow between the practice or clinic and external health care organizations	Clinicians' work during patient visit	Clinicians' thought processes as they care for patients	Access to patient-related information
#1	Electronic tasking means that paper notes are no longer lost or misplaced, and I can easily see what is in someone else's "inbox." However if a parent calls about three kids with the same question, then three separate tasks must be created to go in 3 charts. We do more electronic tasking and less sticky notes or face-to-face communication.	Now I must electronically task requests about procedures to be scheduled as well as fill out the pertinent procedure order form. We do not yet have electronic ordering, which theoretically should make care coordination easier.	Information to/from pharmacies is somewhat better with e-prescribing, but we still make errors that the pharmacy has to call us about. Communication from sites outside our own institution still comes paper based and is scanned into the record.	Putting data into the EMR can be time consuming as you search among the options it allows you for Medical History. You cannot put in free text except as a comment within a diagnosis. Recording medications takes a bit, but once it is there, renewing is much faster. Our notes are still paper based, then scanned in, so that hasn't taken more time.	I get distracted by the computer during the visit. However, having access to all the records from our health care system during the visit can make decisions more informed. Also with e-prescribing I have a better idea of what prescriptions might be covered by their insurance.	Much easier; no longer have to search for a chart. Occasionally have to search for paper that hasn't been scanned in yet.
#2			However on the other hand, when in a hurry, I have faxed prescriptions on the wrong patients, as I changed rooms but not charts on my laptop and some of the prescription templates in the program don't include pediatric formulations so are confusing to pharmacies.	I find that as a physician I am doing a lot of tasks previously done by others. I fax labs and notes to specialists and I end up typing a lot into templated notes that I would have dictated in the past. I have a voice recognition system that is inefficient. In the end, electronic health records adds about an hour onto my day, making most days at least 12 hours long.		I can access our record from home and from the hospital when I am admitting a patient or seeing them in the ED. This does improve patient care.

**Table 5. Request for Information responses: Impact of particular health IT applications on different domains of a practice or clinic**

	Communication among practice or clinic staff	Coordination of care among practice or clinic staff	Information flow between the practice or clinic and external health care organizations	Clinicians' work during patient visit	Clinicians' thought processes as they care for patients	Access to patient-related information
#3		<p>One reported benefit of electronic health records is the ability of practice staff to delegate tasks at the point of care. A nurse can check the patient in, collect the history, take vital signs, and then send an electronic message to the physician when the patient is ready to be seen. The physician conducts the exam and can order immunizations to be prepared while still in the room with the patient. As the physician leaves the exam room, the nurse is ready to walk in with the immunizations, any necessary referrals, patient handouts, etc. Depending on the product, the EHR may be able to use visual cues to differentiate between physician, nurse, and administrative functions so that each staff member can clearly identify his/her own responsibilities. The difference in pre-EHR and post-EHR workflow is demonstrated in the following anecdote from an AAP member:</p> <p>"One day years ago I walked in ready to see patients, but I needed the nurse to do something for me. She was walking down the hall with a stack of paper charts saying that people were yelling for their camp forms that she didn't have time to get. That was it. The school and camp form on our EHR is 'low hanging fruit.' The time and money saving was</p>	<p>Ideally, EHRs would be able to exchange data seamlessly with hospitals, home medical equipment, laboratories, radiology, patient personal health records, and other physician practices. While this is not yet realistic, health IT has enhanced the ability of health care providers to access patient health information when needed. One member reports receiving a late-night call from an emergency department about one of his patients. He was able to log into his EHR from home; generate a summary of the child's current diagnoses, medications, and treatment plans; and fax it to the hospital. With the pertinent information in hand, the hospital was able to provide appropriate urgent care, adjust a medication dosage, and discharge the patient for followup with the pediatrician.</p>	<p>One of the key benefits of health information technology is the availability of clinical decision support resources at the point of care. Such resources can include structured templates for preventive and acute care, recommendations for vaccinations, preferred treatment lists, drug efficacy reports, pediatric medication dose calculation, and flowsheet reports or registries to monitor the progress of patients with chronic conditions. These benefits may come at the cost of increased data entry responsibilities for clinical staff, including physicians. A poorly designed system may aggravate the burden of data entry; therefore, it is crucial that vendors design and practices select health information technology that allows data to be entered in a manner that is instinctive and efficient for the clinicians. A pediatrician in solo practice selected an EHR that used the "SOAP" notes format he was already accustomed to using in his paper charts. In addition, some charting responsibilities that were once delegated to nursing staff may now require the physician to enter the data directly into the EHR.</p> <p>One member noted, "There were many tasks that could be delegated to other personnel with paper charting and billing, then reviewed and signed off by MDs, and this is simply not the case with [EHR]."</p> <p>Also, if clinical data is entered in a</p>		<p>After implementing health information technology, many pediatricians appreciate the ability to access patient charts from home when responding to patient calls. Electronic prescribing is generally appreciated by pediatricians and their office staff when they realize that pharmacy callbacks are significantly reduced. Some pediatric practices also discover some unexpected benefits of health information technology. According to one pediatrician: "I also used to hate it when the 'to do' pile of consult notes, phone calls, etc., piled up and got unwieldy. Now it's just a number on the computer screen of things to be done. It still bugs me to see the number grow, but I find it very easy to get a few done quickly in between patients."</p>

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		huge. We give the parents three copies of the updated school and camp form at the time of the physical (click a button that generates the form and another one that says 'print' and then click 3 on the dialog box that pops up). My staff is now free to do other things.”		free-text format, the increased charting time may not result in improved care quality.		
#4	MedTrak enables real-time communication among the clinical staff using interactive dashboards and work lists. Additionally, MedTrak provides an internal messaging system to enable staff members to communicate without using paper.	MedTrak features a Clinic Status screen that the clinical staff uses to coordinate care between all of the providers and staff. This real-time dashboard is the focal point for clinical processing when the patient is in the medical facility.	MedTrak provides direct information transmission to external health care organizations in addition to e-mail and auto-faxing.	MedTrak provides every tool needed by physicians to document their work during the patient's visit, including documentation of the history and exam, CPOE, diagnosing the patient, prescribing and dispensing medications, aftercare instructions including scheduling the next visit, and determination of the evaluation and management level of service code.	MedTrak provides real-time tools for clinicians to document their thought process while they care for patients. This improves communication among the clinical staff and limits the possibility of missing an order.	Because MedTrak is Internet based, patient-related information is available at all times from anywhere the clinician has a secure Internet connection.

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	Communication among practice or clinic staff	Coordination of care among practice or clinic staff	Information flow between the practice or clinic and external health care organizations	Clinicians' work during patient visit	Clinicians' thought processes as they care for patients	Access to patient-related information
#5	EMR has facilitated communication between staff. It is quick, reliable, with the ability to track it. Over time the practice can eliminate wasteful use of paper, such as paper charts, paper memos, etc. Documentation is more timely; hence there is improved communication, though, at times, interpersonal interaction between staff can diminish.	Notes documented in the EMR are readily available. They can be accessed by the care team within the practice. Providers are diligent about completing note documentation in a timely manner. That helps during cross-coverage on weekends. Patient calls can be answered more effectively since information is up to date and always at hand. It facilitates accurate understanding of a patient's status. In the past, providers relied on patient word on whether a prescription was written or renewed; now it can be readily verified on EMR. It is a paradigm shift in the way information is being accessed. The serial approach of information access (where only one person could access a patient chart at once), is now moving to a parallel approach (several people can access the chart and perform charting at the same time). Communication between the practice staff is enhanced with the inbuilt e-mail system in the EMR. Messages can now be communicated more quickly; they can be attached to a patient's chart and can be traced, documented, and followed up on.	-Notes can be viewed by other providers within the health system using the same EMR. Notes can also be sent to consultants in several ways (such as secure e-mail/fax). *Medications are sent electronically to pharmacies. They are clear, legible, tamper proof, and traceable. Information can be looked up, questions can be quickly answered. *Patient radiology images and interpretations are available sooner in the EMR compared to the past when providers relied on getting films and interpretations on paper.  All of this promotes quality care and patient safety.	The EMR has been a bonus but adds time during a patient visit. Provider can look up lab results, medication list, etc., and review with the patient. The patient is now more actively engaged during a visit. But this comes at a cost, which is more time being spent in the exam room. On the plus side, provider can accomplish a lot with the patient and spend less time at the end of patient's visit.	Certain providers have found that their thought process of step-by-step looking at clinical information has changed. Information within the EMR is structured, and it directs a provider to follow it in a specific sequence. Adapting to this way of thinking does not come without its struggle.	As stated above, it has overall been a bonus for the entire care team.
#6	[Vendor deidentified] has a very efficient internal messaging tool which has increased					

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	<p>accountability. However, until community health care and political leaders agree on a blueprint for the future, we will not have a health information exchange that allows all EMRs to communicate with each other. Small steps are being taken in that direction, but it is going to take leadership and hard work.</p>					

AAP=American Academy of Pediatrics. CPOE=computerized provider order entry. ED=emergency department. EHR=electronic health record. EMR=electronic medical record. IT=information technology. SOAP=subjective objective assessment plan.

[These comments were not direct responses to the RFI but are relevant to the project.]

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
#1	<p>Identified pitfalls: *Vendor differences in implementing XPDL, a standard workflow definition language.            *Clinician-friendliness of resulting flowcharts. (Complex processes benefit from using hierarchical process arrangement, use of subflows).            *Event listener for EHR events—must be supported well by the EHR system.</p> <p>How we study workflow:            *Patient long-term workflow which specialties patient see.            *Study of physician's use of EHR submodules—medication management, order entry, documentation.</p> <p>Workflow redesign:            *Our goal is to identify the right opportunity in the workflow for an intervention at the point of care with high specificity, with the goal of improving quality and coordination of care.</p>
#2	<p>*Workflow changes are inherent to implementation of an EHR.            *Most doctors, nurses, and administrators don't realize this. There is a common misconception that EHRs are "software that you plug in and start to run."            *Most IT people don't understand clinical workflows.            *Most clinical directors aren't used to having to understand their workflows to the degree needed to effectively manage their change and bargain with other clinical departments.            *Most workflow bargaining sessions fail due to:                a. Inadequate understanding of the clinical workflow.                b. Interpersonal politics interfering with effective bargaining.</p> <p>*One difficulty is that this is a new, emerging field that is not well understood:                a. It's not exactly IT.                b. It's not exactly clinical.                c. It's about managing cultural and behavioral changes in a hospital.</p>

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
#3	<p>I find that an EMR has shifted some of the workflow from secretarial staff to providers. In the old workflow the front desk would take labs off the printer, pull the chart, and bring to my desk. Now I just get the lab papers; I have to pull up the chart in the EMR.</p> <p>Billing online has been onerous. I used to be able to quickly check off boxes on a paper. Now I have four pages with multiple subboxes of information I must click through to send a bill. The work of entering billing information has shifted from a secretarial person in the billing office to me.</p> <p>My analogy is that transitioning to an EMR is like having a stroke—you have to learn to do everything over again, and sometimes in a new way. It also helps you discover all of the "hidden workflow" of your office that wasn't obvious.</p> <p>This being said, I would not choose to go back to paper-based records.</p> <p>What I would like to see is my institution rolling out more functionality in the EMR—structured online notes that allow data from the visit (prescribing, ordering tests, diagnosis) to roll seamlessly into billing and ordering.</p>
#4	<p>The biggest change in workflow is through electronic messaging. We message through the patient's chart regarding tasks to do and reminders for other practitioners and nurses. We do electronic prescriptions that are faxed to local pharmacies. Notes and letters from other physicians/hospitals that are faxed to us are then electronically entered into our record. Our system is not ideal though; it took a year to interface the hospital labs into our new system and we still cannot electronically transmit lab and x-ray orders.</p> <p>It is very expensive so it adds to my overhead.</p> <p>I am a part of a self-run multispecialty group of two family practice offices and our pediatric office. It was a group decision. We chose to use an EMR, I think primarily to keep up with current technology, improve on quality of care, and help with billing, coding, and records.</p> <p>I was not involved in the decisionmaking with regard to EMR selection but I think I can sum it up. Our original program was [vendor deidentified]. It is set up like a chart; there is a lot of free texting and so it was flexible. The downside of that EMR is the flexibility. As I could free text diagnoses, I could then not search for them later. This made it difficult to retrieve data. The support of the program was not very good, either. I think because the diagnoses were not linked to any ICD-9 code there was no billing advantage to the program.</p> <p>We switched to [vendor deidentified]. It was supposed to interface well with other EMRs so we could get labs directly into the program. It came with a billing part of the software. It also had a lot of templates in the program already, including patient education handouts, and when you had a diagnosis in your note and ordered a lab, it pulled up the most frequent labs ordered or medications ordered for that diagnosis. It also kept track of your most frequently used diagnoses, medications with dosages, and labs ordered. It was supposed to automatically link lab and x-ray orders to the nearby hospitals.</p>

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Response no.	Responses not associated with RFI components
	<p>To prepare for both EMR implementations we had a team that decided on the EMRs. Then each area of each practice had staff trained more in the use of the EMR. We then had training by the software staff. With the first EMR, we tried to update our paper charts before implementation. With the second one, we tried sending immunization records over before implementation and update charts soon after.</p>
	<p>In neither case was the EMR what it was advertised to be. We have an IT staff for our offices of three people. They did a good job of having the hardware ready and support for those questions. In a few months I was able to access our EMR at the local hospital. This made hospital care of our patients much better. I could verify their history and medications off site. The training by the software staff was okay for the first but not very good for the [vendor deidentified] EMR. Many things they trained us to do didn't work. The program wasn't ready for our volume and was extremely slow, taking about 30 seconds to bring up a note. That affected patient care. Some things they didn't tell us—like to click on something after free texting a plan at the end of a note—resulted in incomplete notes for about 6 months. The program has so many bugs. A part of the program might be working great and then after an update it will stop working and I lose entire notes. It took 1½ years to get labs directly into the EMR and there was no backup plan. I was in dread of missing an abnormal result. We still don't have a direct interface with the lab orders. We have to print and fax the orders.</p>
	<p>We have a voice-recognition program but it is slower than typing. There is also a way to dictate only parts of a note into a template and that doesn't work. Overall there are so many options, desktops, buttons that it is overwhelming.</p> <p>Of concern is that there is no pediatric dosing check or calculator. The drug alarm comes up with every prescription so I don't even look at it. There is not enough flexibility with suspensions, and so sometimes the prescription is in error. Many details in my prescription do not appear in the fax that the pharmacy gets. I'm sorry, I could go on and on.</p>
	<p>With the first EMR we only addressed superficial workflow issues (i.e., who did what). We are now almost 2 years into the second EMR and are now just getting down to significant workflow issues. But we have no specific system. Everyone felt overwhelmed so it was difficult to ask anyone to do more work.</p>
	<p>We didn't use a tool or method to analyze or redesign our workflow for either implementation. I don't really know of any tools. Recently two people in our office went to a meeting about efficiency and the only thing I have heard is trying new things, reassessing, and making small frequent changes. (I can't remember the specific name for that process.) I would be interested in any tool available.</p>

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Response no.	Responses not associated with RFI components
#5	<p>The largest impact of IT on work flow is leaving out the end user in the design process. I am a staff nurse with 11 logons and programs that I am required to use. My productivity would be much higher if the programs were designed with the user in mind. Too often, the designer has concepts that, in theory, are productive, and have protective measures. Recently, I was chosen to meet with IT because our physicians wanted the electronic medication program replaced. In discussion, many issues arose.</p> <ul style="list-style-type: none"> <li>* Six IT gurus did not know basic abbreviations we used.</li> <li>All of the mandatory boxes could be checked with no information entered.</li> <li>* The exhaustive database was so exhaustive; it was mostly bypassed for free-form text. This deactivated the interaction check.</li> <li>* Transferred patients were handled inconsistently. The reason was that a time limit was placed on the information transferring over. The IT staff was not aware the short time was not enough, and the clock started ticking based on the sending unit, not the receiving unit. Time may be up when the patient arrives.</li> </ul> <p>Needless to say, the programs need both IT and the end user working together to make the situation work.</p>
#6	<p>In addition to the survey form itself, there are a number of associated survey materials in the Medical Office Survey Toolkit, available on the AHRQ Web site (<a href="http://www.ahrq.gov/qual/patientsafetyculture/mosurvindex.htm">http://www.ahrq.gov/qual/patientsafetyculture/mosurvindex.htm</a>), that medical offices can use in conjunction with the survey to assist them with survey administration, data entry and analysis, and presentation of results.</p> <p>AHRQ is developing a large comparative database for the Medical Office Survey on Patient Safety Culture (SOPS) that will be modeled after the Hospital SOPS comparative database. This new database will enable medical offices to compare their survey results with other facilities. Medical offices in the United States that have administered the AHRQ survey will be asked to voluntarily submit data to the new database, which should be available in 2010/2011.</p>
#7	<p>Finally, the EHR should support a workflow that includes quality improvement activities. The AAP has several resources available to help pediatricians understand and incorporate quality improvement into their practices. These include:</p> <ul style="list-style-type: none"> <li>* The National Center for Medical Home Implementation: Provides detailed information on transforming a pediatric practice into a Family-Centered Medical Home, including an interactive toolkit (<a href="http://www.medicalhomeinfo.org">http://www.medicalhomeinfo.org</a>).</li> <li>* Education in Quality Improvement for Pediatric Practice (eQIPP): Provides continuing medical education through clinical topic-specific education and quality improvement strategies(<a href="http://www.eqipp.org">http://www.eqipp.org</a>).</li> <li>* Quality Improvement Innovation Network (QuINN): A program at the AAP that involves a network of practicing pediatricians and their staff teams who use quality improvement methods to test tools, interventions, and strategies in order to improve health care and outcomes for children and their families (<a href="http://www.aap.org/qualityimprovement/quin">http://www.aap.org/qualityimprovement/quin</a>).</li> </ul>

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
<b>#8</b>	<p>Role of physician organizations</p> <p>Ultimately, we believe the importance of physician organizations and physician leadership and engagement within our region (and in other areas of the country where POs play a central role in health care) to drive change and adoption cannot be understated. If physicians are to not only agree to adopt technology but to also use it in meaningful ways, support from the physician community and their respective physician organizations needs to be central in making it happen. Using POs as the distribution model for technology is key to successful adoption.</p>
	<p>Role of practice champion (physician and/or office manager)</p> <p>In line with the above comment around “macro-level” physician leadership, it is also critical to have a practice champion, whether the champion be a physician and/or office manager, to lead implementation and facilitate adoption within the practice.</p>
	<p>Identifying technical infrastructure needs and securing appropriate interfaces between practice management systems and technology</p> <p>The first review we conduct in any physician office implementing technology is a review of current Internet connectivity; network infrastructure and hardware needs to ensure appropriate tools (e.g., computers, tablets) are in place in the proper locations prior to training and workflow redesign. Additionally, we cannot overstate the importance of prepopulating patient demographics into any technology application put into use which is facilitated by interfacing the physician practice management system and the given technology. Further, we ensure through our implementation process that we do not cause redundant work processes or data entry. These are the first steps in making workflow transitions through technology, and are essential to moving on to implementing technology and redesigning workflow.</p>
	<p>Building workflow assessment and redesign into training and implementation processes</p> <p>It is critical to facilitate an understanding among physicians and their office staff that the clinical perspective is built into the available technology and training process that facilitates adoption. Building off of that foundation, and based on our experience, workflow assessment and redesign are an essential part of technology adoption: Implementing technology on a less than ideal workflow will not realize the improvements the health care community is striving for through the use of technology. It will only make the daily work in practices, and ultimately improvements in care processes and outcomes, more difficult to achieve.</p>

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
Workflow analysis and redesign	<p>my1HIE® has a full-time, postsecondary, instructional design expert on staff who has tailored training and educational programming (both introductory and continuing) around all of the technology offerings through my1HIE®. As part of the development of this training, the instructional design expert met with early-adopter practices to craft the training to incorporate workflow assessment and redesign tools, including flowcharts of the typical workflow around appointment scheduling, patient visits, labs and/or other referrals required, lab/referral results, population outreach, and reporting. The flowcharts were then tested and incorporated into the implementation and training process. Each of the flowcharts maps the typical processes by participating individuals (e.g., patients, front desk staff, office manager, medical assistants, physicians) in the workflow, with highlights and instructions on where technology enters the process and the specific use of the technology at that point in the process (for example, what should be entered into the system and when). The workflows are revised as needed based on the unique circumstances of each implementing practice, but do provide a general template to practices from which to work.</p>
Direct training and train-the-trainer	<p>my1HIE® provides either direct training to physicians and office staff or training through a train-the-trainer model. Training and education, including workflow assessment and redesign, are provided both pre- and post-implementation through conference calls and in-person sessions. Each component of the training (from introductory sessions to sessions covering each function and application of my1HIE®) addresses workflow assessment and redesign as a central theme and includes a set curriculum, a target audience (physician, office staff, etc.), and “prerequisites” so that learning happens along a continuum. We have found that it is important to use as many visuals (rather than descriptive narrative) and applied learning opportunities (i.e., using the technology during the training and redesign process) as is possible during the transition.</p>
Showing technology can improve workflow	<p>Although taking the time to offer a comprehensive training and workflow assessment/redesign process requires time, we believe and stress to those implementing technology that spending this time on the front end of the process will ultimately make the transition easier. We look for “early win” opportunities to show practices that technology can quickly result in improved workflow, time efficiencies, less burden associated with time-consuming paper-based followup, including population-level reporting and associated followup. my1HIE® also has a physician technical and functionality advisory workgroup so that physician users are able to provide recommendations around changes to the technology available that will facilitate further improvements in the workflow supported by those technologies.</p>

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
	<p>Tracking use and intervening to secure use</p> <p>my1HIE® tracks a variety of user statistics to monitor practice use of technology once it's been implemented—for example, e-prescribing to identify low utilizers (or nonutilizers) for targeted outreach and additional training. This strategy facilitates provider use of my1HIE® available technologies and provides an opportunity for reassessment of workflow needs to address any issues that the technology is presenting to the practice in order to overcome these challenges and facilitate meaningful use. Additionally, my1HIE® offers online assistance as well as a help desk staffed by full-time internal employees well trained in the technology in order to troubleshoot issues as they arise in practices. It is important to understand that training is not a single event but needs to happen over a period of time, through a continuous series of events and interactions, to facilitate the necessary changes in workflow and achieve adoption.</p>
#9	<p>Business process management can make a tremendous difference to the success of IT implementation and adoption by small and medium-sized physician practices for a simple reason: A majority of the processes change from manual to IT driven with IT systems implementation and have to be redesigned. Success of health care IT implementation is also driven by end-user acceptance and participation. A sophisticated health care IT system, using the best-of-breed technology, can be a failure if users find it cumbersome to use. The transition from the old way of doing things to the new way of doing things should be made smooth. Hence, the process modeling for health care IT implementation should be a collaborative effort involving representations from all key stakeholders in the physician practice.</p>
	<p>In IT implementations, physician practices have common objectives of enabling secure access to clinical information at the point of service, reducing adverse clinical events, improving quality of care delivered, and enhancing clinical decisionmaking. Considering they have similar goals, physician practices can borrow process models from successful EMR implementations. Some EMR and other health care IT vendors provide guidance on the best practices based approach for configuring their systems. However, the process models of successful implementations can serve as a starting point only, and each physician practice must tailor these models based on the nature of the practice, scope of health care IT implementation, technology selection, State regulations, and many other practice-specific factors.</p>
	<p>Any health care IT system can yield maximum returns only if the business processes related to the system are streamlined and fine tuned for optimal performance. Smartly designed processes help reduce risks, increase productivity, reduce costs, save time, improve service levels, and improve the quality of information available.</p>
	<p>Designing business processes should be an iterative activity, where processes are optimized through introducing additional ways to automate; reduce work, time, and costs; improve member experience and quality; etc. Use design heuristics (e.g., activities that can happen in parallel, should not be sequenced) to optimize the process. Staff should be trained to drive incremental improvement and should begin to imbibe the same as a culture. Once the to-be process is finalized, identify process controls and key performance indicators. Third-party BPM modelers can be used for to-be process modeling.</p> <p>Business processes have to be continuously reinvented with changing market needs and new regulations. They also need analysis and optimization based on trends of key performance indicators and their impact. We need to define operational report requirements at this stage, which will serve as an executive dashboard for operational statistics and trends and will help them in identifying process areas that need optimization. It is useful to utilize an organizational process optimization approach so that it is a focused regular initiative and not one odd effort from time to time.</p> <p>Several techniques are used as enablers for business process optimization, like process maturity assessments, hybrid process improvement methods, and change management techniques, to name a few. There are many process analysis techniques which can be used for selecting processes for optimization, like failure mode and effect analysis, fault tree analysis, Pareto analysis, process capability, selection matrix, and many more. Performance indicators or KPIs give us a feel for the dynamics to focus our optimization efforts on the right processes.</p>

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
<b>#10</b>	<p>We would encourage AHRQ to consider developing a checklist or questionnaire that would enable a health care provider to ask questions of a vendor to ensure the product meets their needs and is compliant with these regulations. These include:</p> <ol style="list-style-type: none"> <li>1. Is your product compliant with applicable Federal regulations, such as HIPAA and meaningful use?</li> <li>2. What are the privacy and security features of your product?</li> <li>3. If Federal regulations change, what are the costs associated with making upgrades to the product? Typically how long do these upgrades take?</li> <li>4. How do you track changes to federal requirements?</li> <li>5. What, if any, level of training do you provide in the use of the product and its features? What costs are associated with this training?</li> <li>6. What level of product support do you provide once the product is purchased? What costs are associated with this IT support?</li> <li>7. What additional equipment would I need to purchase in order to use the product (computers, servers, etc.)?</li> <li>8. Has your product received any third-party certifications, such as CCHIT certification?</li> <li>9. Is your product interoperable (able to exchange information with) external entities? What process must I go through in order to achieve interoperability and coordination with my health care colleagues?</li> </ol>
	<p>Toolkit's ability to help providers assess their readiness</p> <p>Providers also need to consider their needs and resources before adopting health IT. Questions a provider needs to ask of him or herself before investing in health information technology could include:</p> <ol style="list-style-type: none"> <li>1. How much money do I have to invest in health IT?</li> <li>2. How will I pay for my investment in health IT?</li> <li>3. When do I expect to recoup the costs or achieve the financial benefit of health IT? When will I need to recoup these costs?</li> <li>4. What functions do I need health IT to serve within my practice?</li> <li>5. What is the goal of health IT adoption for my practice?</li> <li>6. What level of staff support will I need? Do I have that level of support currently or will I need to acquire that help?</li> <li>7. Are the types of information used to describe my patient population included in the product?</li> </ol>
	<p>Items to include in toolkit</p> <p>In order to access their readiness and the readiness of any vendor, health care providers will need a lot of information at their disposal. Initially, providers will need to consider their ability to use the technology as well as its capabilities. The cost associated with the product and its implementation, such as loss of productivity during implementation and training costs, will also need to be determined. After these initial considerations, providers will need the tools to evaluate, compare, and contrast the products available in the marketplace. Questionnaires that help providers weed through these complex issues would be a very important component of any toolkit. Additionally, summary information, such as the average cost of health IT adoption and implementation, would be important for providers to have at their disposal.</p>
	<p>Challenges of a toolkit</p> <p>One challenge such a toolkit may face is its ability to hold meaning or be applicable to a variety of providers working in a myriad of health care settings with divergent patient needs. Any toolkit developed will need to be balanced in a way that provides enough detail to help people make an educated decision but not so detailed that it prevents it from being useful to a diverse patient population. Access to the toolkit is another crucial aspect which will determine its effectiveness and use. While the Request for Information indicates the toolkit will be available via the Internet, AHRQ should consider making this information available in a variety of formats, including written and via an interactive course (a Webinar or audio conference). This will increase access and encourage providers to receive and use the information in a manner most comfortable to them.</p>

**Table 6. Request for Information responses not associated with RFI components**

Response no.	Responses not associated with RFI components
#11	<p>Impact on office and workflow...            Tasks were redefined. We had to designate a specific person to manage faxes and reports. Prior to the EMR, whoever passed the fax inbox and noticed paper in it dealt with the incoming fax or put the report on the MD's desk. From the EMR vendor viewpoint, staff functions as simple as this must be incorporated in the training plan. Everyone had to relearn cues. We learned to look at the computer screen to recognize where patients were in the encounter process. Ultimately, this simple transition made our office seem calmer.</p> <p>Paper is much more under control now. It comes in, gets scanned, and immediately goes into the shredder.</p> <p>From the EMR vendor viewpoint, educating practices about their network and hardware is an ongoing process. We continually reinforce aversion tactics for viruses, need for backup, and need for security.</p>

AAP=American Academy of Pediatrics. AHRQ=Agency for Healthcare Research and Quality. BPM=business project management. CCHIT=Certification Commission for Health Information Technology. EHR=electronic health record. EMR=electronic medical record. HIPAA=Health Insurance Portability & Accountability Act. ICD-9=Ninth Revision, International Classification of Diseases. IT=information technology. KPI=key performance indicator. PO=physician organization. RFI=Request for Information.

**Table 7. Request for Information responses: Tools**

Tool	Use, Advantages, Disadvantages
Workflow editors: Enhydra JaWE, Fujitsu Interstage Business Studio, and TIBCO business studio	No further information provided
Workflow engines: Enhydra shark, Fujitsu Interstage Engine	No further information provided
Process mining: ProM tool	No further information provided
Medical Office survey on Patient safety Culture (SOPS)	<p>*A tool that medical offices can use to assess patient safety culture and quality issues, information exchange with other settings, office processes and standardization, communication openness, work pressure and pace, and other dimensions of their medical office's patient safety culture, both before and after health information technology implementation.</p> <p>*While Medical Office SOPS can be conducted in any size medical office, it is recommended that survey administration be restricted to medical offices with at least three providers—i.e., physicians (MD or DO), physician assistants, nurse practitioners, and other providers licensed to diagnose medical problems, treat patients, and prescribe medications. Solo practitioners or offices with only two providers are so small that conducting a survey is probably not an effective way to obtain staff opinions about patient safety culture. Staff in small offices will not feel that their answers are anonymous and may not be willing to complete the survey or answer honestly. It is also recommended that there be at least five respondents in an office before feedback reports are created to protect anonymity. Therefore, offices have to survey more than five providers and staff because it is unlikely that all of them will respond to the survey. In small offices, rather than administering the survey, they can use the survey as a tool to initiate open dialog or discussion about patient safety and quality issues among providers and staff.</p> <p>*The Medical Office Survey on Patient Safety Culture was designed to be appropriate for medical offices of any medical specialty—e.g., medical offices providing primary care services only, other specialty care services only, or a mix of primary and specialty care services.</p>
Data entry and analysis tool for Medical Office Survey on Patient Safety Culture	A Data Entry and Analysis Tool that works with Microsoft® Excel is also available to medical offices. The tool is available by request by sending an e-mail to: <a href="mailto:databasesonsafetyculture@ahrq.hhs.gov">databasesonsafetyculture@ahrq.hhs.gov</a> .
Process mapping guidelines	This simple educational tool shows the practice how to look at a current process, identify complexities and areas of waste. It also gives suggestions for things to consider when determining how the current process can change with EHR implementation.
Operational redesign through workflow analysis	Operational Redesign Through Workflow Analysis—This workbook is a guide to assist practices in examining their current office processes and looking for areas to improve or change with EHR implementation. The guide addresses four key areas of operational redesign: patient flow, point-of-care documentation, in-office communication, and document management. Each section assists practices with analysis of their current process, identifying their vision and goals for the future process, and gives best-practice examples.
Operational redesign: Patient flow	No further information provided.
Operational redesign: Rx refill or renewal	No further information provided.

**Table 7. Request for Information responses: Tools**

Tool	Use, Advantages, Disadvantages
Operational Redesign: Scheduling	Operational Redesign: Scheduling—These three templates help guide a practice through documentation of the current workflow, with information about the same steps with an EHR and best-practice information.
Best-practice considerations: Patient visit	No further information provided.
Best-practice considerations: Labs	No further information provided.
Best-practice considerations: Documents	Three documents list best-practice recommendations that address how the EHR will change current workflow and the steps needed to ensure success with these changes.
Point of Care Documentation	Point of Care Documentation—This tool assists a practice in identifying and analyzing the documentation processes that exist and determining what steps are needed to transition from paper to electronic documentation.
EHR in the Exam Room	This document identifies five key communication behaviors to integrate the computer into the exam room interaction with the patient.
Workflow Assessment	This tool was completed by the practice and shared with the vendor implementation team. This helped the team to identify and map the vendor recommendation for the most efficient workflows.
As-is process mapping	As-is process mapping: Create a process inventory and swim-lane diagrams for the processes to be impacted by IT implementation. BPM modelers available from various technology vendors can be leveraged for as-is process mapping. Swim-lane diagrams are developed with increasing level of details, starting with handoff, then flow model, and if required, task-level model. Identify leverage points for key processes. Acquire a good understanding of process enablers (staff, policies, motivation, information technology, core competencies, etc.) as well as the factors that constrain the process. Collect available data on the performance benchmarks for these processes.
Process standardization	Process standardization: In this step, the as-is manual and legacy IT systems processes are measured against the best practices to identify impediments, opportunities, bottlenecks, lack of compliance, operational and IT problems, thereby identifying processes for optimization. Process controls and performance indicators are identified for the processes, and target values for performance indicators are set based on available industry benchmarks. Interdependencies and interrelationships of processes are also identified and analyzed to understand their impact on process design as well as IT system implementation. It is very likely that different physician practices in the same network may have distinct implementation of common processes. BPR team analyzes and discusses these discrete process flavors to come up with a high level straw man of a converged and streamlined common process that can address needs of most of the clinics and is aligned with best practices. More than one converged process straw man can be developed and analyzed.

**Table 7. Request for Information responses: Tools**

Tool	Use, Advantages, Disadvantages
To-be process definition	<p>To-be process definition: Construct conceptual models of new operational activities for each relevant organizational unit, following the prioritization scheme. Straw-man models will be workflow based and enriched with the relevant business rules. If the IT system to be implemented has been selected, the models should be aligned with the IT system, and configuration constraints of the system will influence to-be model design. Apart from the straw man for the main process flow, it is important to model all the alternate process paths and exceptions. Stakeholder feedback will be used to address problems, impediments, and inefficiencies, as well as to describe the desired outcome. Infrastructure and environmental needs for the processes should be identified. The conceptual data model developed during the as-is definition phase should be revised in light of process changes. Information flow paths must be clearly defined highlighting data gathering, cleansing, storage, retrieval, and consumption processes.</p>
Process execution	<p>Process execution: In this stage, based on to-be process definitions, process scenarios are created. Also, for IT-driven process components, use cases are identified and created. These use cases can be used to build a custom application or can be used to evaluate product solutions available in the market. They can also be leveraged to define configuration specifications for the selected IT package. By now, we should have sufficient information to create a logical data model and define information architecture. The information flow model involving data collection, cleansing, and access is refined. Job cards should be created that describe all the processes from a particular user's perspective. These can be used for user training.</p>
Workflow diagram	<p>*Workflow diagrams, or flowcharts, are used to describe a process or workflow by using pictures or shapes arranged in sequence by a series of lined arrows or connectors. In a simple workflow diagram, each shape or picture represents a specific step in a process. Each step or shape in the workflow is joined by use of a line or connector.</p>
Flow chart	<p>*Workflow diagrams' intended purpose is as a tool to help distinguish between efficient steps in the process and nonefficient steps in the process. These diagrams are used to chart the macro-level flow of specific processes within the practice in a manner where the focus is placed on the process rather than on the person performing the process.</p> <p>*Workflow diagrams allow one to look at a process more objectively. They allow an understanding of how steps are interrelated within the process and enable better problem identification within the process.</p> <p>Finally, this tool allows one to simulate or project a particular process without necessarily committing significant design/development resources.</p>
Process map	<p>Advantages:</p> <p>*Easily represent potentially complex processes in an easy-to-understand format.</p> <p>*Provide a relatively simple medium to both identify areas of inefficiency in a process as well as project how new improvement opportunities may impact the overall existing workflow.</p>
Process flow	<p>Disadvantages:</p> <p>* Workflow diagrams are only as good as the information used to create them. Hence, if a diagram was created from an interview or observation exercise, then the diagram will only be as good as the ability of such exercises to be representative of the actual process to be diagramed.</p> <p>* Typical workflow diagrams are limited in their capacity to diagram variability in workflow. Therefore, workflow diagrams are best used in conjunction with other tools that can better represent workflow variability.</p>

**Table 7. Request for Information responses: Tools**

Tool	Use, Advantages, Disadvantages
Time study, day in a life	<p>*Time study is a basic observation tool in which an analyst will observe a particular workflow and keep a record of how much time is spent in each step of the process.</p> <p>*The study's main purpose is to measure the amount of time needed to perform each step in a given workflow. Additionally, if a time study is performed on the same workflow repeatedly the study may provide a measurement of variability in the workflow.</p> <p>Advantages: The main advantage of time studies is that they can measure the amount of time a user spends performing a given step in a workflow. One common criticism employed by EMR users is that usage of some EMR functionalities take much longer than anticipated. A time study allows validation of such a claim. Moreover, if in fact usage of the EMR functionality is measured as taking longer than anticipated, then EMR support personnel could potentially analyze such observations. This analysis could lead the EMR support personnel to engineer new workflows that could better leverage EMR functionality and accomplish the measured workflow in less time than previously thought.</p> <p>Disadvantages: *The most typical disadvantage is what the literature calls the "Hawthorne effect," which essentially says that subjects being observed will act differently than normal in that they know they are being observed. This would be true in a standard time-study observation where an observer would shadow a clinician performing an activity. These clinicians would act a bit differently since they know they are being observed. *Time studies are very difficult to perform on large-scale engagements. Studies of this kind are resource intensive since it requires a time-study analyst to "shadow" or observe the process for long periods. In addition, time-study measurements must then be analyzed and categorized for the study to have any meaning. Overall, this makes this type of study resource intensive and it can become difficult to scale.</p>
Spaghetti map, spaghetti diagram	<p>Motion study is a standard tool utilized to describe physical movement from a given workflow. These tools have been in use for decades in a wide area of applications and industry. Motion study's purpose is to diagram the physical movement of a particular workflow in hopes of highlighting areas of efficiency and inefficiency. It was used in conjunction with process mapping to capture the physical and spatial elements that impact the process. A floor plan of the area was developed and motion study was undertaken to understand how the process flow is impacted by the layout and to expose large distances traveled between steps within a process. Workflow analysts observed "typical" patient flow and translated the observation notes into lines on the floor plan. The distance traveled by each staff member in the process was computed and the distance traveled determined.</p> <p>Advantages: The main advantage of a motion study is that it has the potential of highlighting multiple areas of inefficiencies that can be improved upon by introduction of information systems. In the context of health care, much of the physical movement observed in workflows is directly related to the communication of clinical information. By careful selection and introduction of specific information systems, one can reduce the amount of travel exhibited in the study. The motion study can effectively showcase areas of inefficiency as well as provide a testing area for new workflows.</p> <p>Disadvantages: Motion studies are also susceptible to variability, meaning that different physical movements or paths may be taken depending on the patient or clinician at hand. Performing multiple observations may provide some control by better accounting for this variability. The Hawthorne effect may play a part here too, but will not have a profound effect, as indicated in the other tools</p>

BPM=business project model. BPR=business project reengineering. EHR=electronic health record. EMR=electronic medical record. IT=information technology.

## Discussion

The majority of the respondents that provided demographic information were affiliated with clinics that had fewer than 25,000 patient visits in 2008. They referenced many functionalities and characteristics of health IT, including electronic health history, immunization, growth tracking, scanned/dictated notes, e-prescribing, scanned medical records, billing, scheduling registration, electronic medical records, computerized provider order entry, results tracking, referral tracking, surgery scheduling, collection, digital imaging, provider medical education, patient teaching materials, primary care screening, lab results, and integrated practice management. The majority of those that responded had been using their health IT applications for at least 5 years. One respondent had been using its health IT for over 15 years, and another for only 1 year.

Several workflow analysis and redesign tools were either submitted or suggested, and these may be incorporated into the toolkit that will be published in 2011. The tools are referenced in Tables 3 and 7. The majority of the referenced or submitted tools involve evaluating workflow processes through various forms of mapping or charting. Other tools help to identify critical processes through questions or templates.

Support provided during implementation included the presence or easy access of health IT specialists, vendor training, limiting patient visits during implementation and initial weeks prior to going live, doubling appointment times, running both the paper and electronic systems in parallel for a short time, and using medical records staff or hiring temporary staff to support paper-chart conversion to electronic charts.

Training mechanisms were varied and usually vendor dependent. One respondent recommended that “practices invest in as much upfront training as feasible in order to avoid costly setbacks after going live with the new technology.” Another respondent noted: “[T]here is a learning curve; therefore initially the staff spends more time to complete tasks. Over time, this time gradually reduces and levels off.” Interestingly, another respondent reported going to work for the EMR reseller due to a “miserable” implementation. Once working for the reseller, this person changed the schedule to balance the frequency, effectiveness, and cost of training.

All those that responded regarding health IT interfacing noted their health IT did have interfacing capabilities. Interfaces referenced included health care organizations/systems, lab systems, diagnostic imaging systems, hospital master person index systems, external billing systems, and clearinghouses. One respondent stated: “As users get comfortable with the IT applications, they have shown interest and desire for interfaces with practice-specific systems to enable them to work more efficiently.”

The majority of respondents did not perform a formal evaluation of their health IT. One respondent, from a large organization, noted that they did not have a formal evaluation, but they did have an “EMR workflow efficiency program,” where an EMR specialist would measure EMR satisfaction and EMR workflow efficiency in the practices. Another organization responded with suggestions for a direct evaluation, including measures such as “increased revenue through more accurate billing, improved patient satisfaction, elimination of drug errors

and interactions, improved quality of care based on measures such as immunization rates, improved chronic care management including the development of disease registries, office efficiency as measured by the ability of providers to complete all charting responsibilities and leave the office on time, staff efficiency through reduction or elimination of time spent pulling charts and entering billing charges, office efficiency through enhanced intraoffice communication, improved patient/family satisfaction.”

Overall, respondents agreed that communication among practice/clinic staff improved. One respondent noted that with electronic tasking, paper notes could no longer be lost or misplaced. Others commented that documentation was more timely and accountability increased. A vendor had enabled real-time communication among clinic staff using interactive dashboards and work lists.

Comments regarding coordination of care among practice/clinic staff were generally positive. An organization noted that a reported benefit “is the ability of practice staff to delegate tasks at the point of care.” A vendor noted they had created a screen that clinic staff could use to coordinate care with the providers and staff. However, one respondent that did not yet have electronic ordering noted they had to both enter electronic task requests about procedures and fill out the procedure order form.

Regarding information flow between the practice/clinic and external health care organizations, most respondents commented on the benefits of e-prescribing. Another noted that radiology images and interpretations were available sooner when not relying on film and paper.

Most respondents noted an increase in time and effort regarding the clinician’s work during a patient visit. One commented: “I find that as a physician I am doing a lot of tasks previously done by others... In the end, electronic health records add about an hour onto my day, making most days at least 12 hours long.” Another respondent noted: “[T]he EMR has been a bonus but adds time during a patient’s visit...On the plus side, a provider can accomplish a lot with the patient and spend less time at the end of a patient’s visit.”

Two respondents commented on the impact of health IT on the clinicians’ thought processes when caring for patients. The first noted: “I get distracted by the computer during the visit. However, having access to all the records from our health care system during the visit can make decisions more informed.” The other commented: “Certain providers have found that their thought process of step-by-step looking at clinical information has changed. Information within the EMR is structured, and it directs a provider to follow it in a specific sequence. Adapting to this way of thinking does not come without its struggle.”

Most respondents agreed that access to patient-related information was easier, more accessible, and “a bonus to the entire care team.”

Beyond responding directly to the RFI components, respondents shared a wealth of relevant information regarding the impact of health IT implementation on workflow, along with other suggestions and/or notes. This information is listed in Table 6.

## Conclusion

Of the 32 responses to the Request for Information, 15 provided useful information that can be incorporated into the toolkit. Four responses are useful as user stories, 8 responses referenced or submitted workflow analysis and redesign tools, and all 15 provided useful information beyond case studies or tools. These responses will inform the development of and/or provide information for our toolkit.

Many of the respondents stressed the importance of their experiences regarding workflow impact during and after health IT implementation. More effort and time need to be directed toward workflow analysis and evaluation before, during, and after health IT implementation. The toolkit we are developing, which will incorporate some of the responses received, aims to educate and assist in the process. We would like to thank all those who took the time to respond to the Request for Information.

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# Appendix: Published Request for Information

Billing Code: 4160-90-P

DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Agency for Healthcare Research and Quality

Request for Tools and Methods Used by Small- and Medium-Sized Practices for Analyzing and Redesigning Workflows either Before or After Health Information Technology Implementation

AGENCY: Agency for Healthcare Research and Quality (AHRQ), HHS.

ACTION: Notice of request for information.

SUMMARY: This notice announces the intention of the Agency for Healthcare Research and Quality (AHRQ) to request information from (1) small- and medium-sized practices about how they study or redesign their workflow, including information on the use of tools and methods for studying workflow, and (2) others (e.g., experts, vendors, professional associations) that have developed, implemented and used tools and methods for studying workflow in the context of health IT implementation and use. Workflow is defined as the way work is performed and patient-related information is communicated within small- and medium-sized practices and between those practices and external organizations such as community pharmacies and local hospitals. It is our understanding that there is currently no standard description of workflows for care processes that can be used to guide decisions of where and how to incorporate health information technology. This Request for Information is part of a three pronged effort to scan the environment, the literature and knowledgeable and interested parties to produce a useful list of resources that may assist small- and medium- medical practices and clinics to consider the utility and potential effectiveness of incorporating health IT into the way they practice and communicate patient information. The responses to this request for information will be considered for reference and possible incorporation into an electronic toolkit to be made available on the Internet to assist small- and medium-sized practices in analyzing or redesigning workflow either before or after implementation of one or more health IT applications. All responses to this request for information are voluntary.

DATES: Submit comments on or before August 24, 2009.

ADDRESSES: Electronic responses are preferred and should be addressed to: [WorkflowRFI@ahrq.hhs.gov](mailto:WorkflowRFI@ahrq.hhs.gov). Non-electronic responses will also be accepted. Please send to:

Teresa Zayas-Cabán  
Senior Manager, Health IT  
Agency for Healthcare Research and Quality  
Attention: Workflow RFI Responses  
540 Gaither Road, Room 6115  
Rockville, MD 20850  
Phone: 301-427-1586

## FOR FURTHER INFORMATION CONTACT:

Teresa Zayas-Cabán, e-mail: [Teresa.ZayasCaban@AHRQ.hhs.gov](mailto:Teresa.ZayasCaban@AHRQ.hhs.gov),  
website of the project on “Incorporating Health Information Technology Into Workflow  
Redesign”: [http://cqpi.engr.wisc.edu/withit\\_home](http://cqpi.engr.wisc.edu/withit_home)

## SUPPLEMENTARY INFORMATION:

### Submission Criteria

To assist small- and medium-sized medical practices or clinics considering implementation of any health IT, AHRQ is requesting information about tools, methods, technologies, and data reporting procedures that may be used to analyze and possibly improve the delivery of health care in such settings. From our perspective, these settings would include practices for which investment in health IT is financially burdensome and therefore regarded as high risk. While AHRQ welcomes all comments on the above described subject, the agency is particularly interested in obtaining information and opinions from small- and medium-sized healthcare practices that have implemented or are considering implementing health information technology as well as information and opinions from workflow or health IT experts, vendors, professional associations, and others that have developed and/or used workflow analysis or redesign tools. In descriptions of workflow analytic tools or approaches and health IT that have been deployed successfully or unsuccessfully, it would be helpful to receive basic information about the characteristics of the practice(s) or clinic(s) where particular tools, approaches, or health IT have been used including:

- The number of physicians and providers (physician assistants or nurse practitioners) in the practice or clinic.
- The total number of staff (e.g., nurses, medical assistants, receptionists, educators) in the practice or clinic.
- The number of patient visits the practice or clinic had in 2008.
- The medical or surgical specialties within the practice or clinic. Specialties can include: family medicine, internal medicine, pediatrics, geriatrics, hematology, oncology, cardiology, pulmonology, endocrinology, gastroenterology, rheumatology, ophthalmology, obstetrics and gynecology, nephrology, infectious diseases, physical medicine and rehabilitation, dermatology, neurosurgery, general surgery, pediatric surgery, cardiovascular surgery, thoracic surgery, vascular surgery, transplant surgery, urology, plastic surgery, orthopedic surgery, otolaryngology, and anesthesiology.
- Any ancillary services located on-site at the practice or clinic. Examples include: laboratory, radiology, physical therapy, occupational therapy, speech therapy, pharmacy.

With regard to health IT, please indicate what specific health IT applications and software have been used in particular settings; e.g.: electronic medical records (EMRs) (i.e., electronic records of health-related information on individual patients that may be created, gathered, managed, and consulted by authorized clinicians and staff within a single health care organization), electronic health records (EHRs) (i.e., electronic records of health-related information on individual

patients that conforms to nationally recognized interoperability standards and that may be created, managed, and consulted by authorized clinicians and staff across more than one health care organization.), computerized provider order entry (or CPOE), e-prescribing, digital imaging, telemedicine, and others. Please include information regarding:

- Functionality of each health IT application (i.e., what you use them for).
- How long each health IT application has been in use.

With regard to workflow analysis and redesign tools, please tell us about any tools, methods, technologies, or data reports to analyze or redesign the way work is done and information flows in your practice or clinic before or after health IT implementation. Examples of tools include process analysis, flowcharting, task analysis and lean management. Other examples include using data reports from a health IT application to analyze or understand processes and workflow.

For each tool, method, technology or data report we would appreciate the following information:

- Name and acronym of the tool, method, technology, or data report.
- Authors, sources and/or references.
- Background about the tool, method, technology, or data report; i.e., how did you learn about it.
- Intended purpose; i.e., what it was used for and at what point it was used during the redesign and/or implementation process.
- How the tool, method, technology, or data report was used. Please describe the procedure or steps for using it as well as who participated in its use.
- Resources needed to use the tool, method, technology, or data report (e.g., expertise, time, software).
- Information about reliability and validity of the tool, method, technology, or data report, if applicable.
- Advantages and disadvantages of the tool, method, technology, or data report.
- How useful, overall, the tool, method, technology, or data report is.
- How easy or difficult is it to use the tool, method, technology, or data report.

Additionally, please provide information that you think will assist our target audience to avoid pitfalls of complicated or inappropriate tools and software. If you are willing and authorized to share any referenced tools, please submit them with your response along with instructional documents related to the tool and its use, including any restrictions or prerequisite permissions necessary for use by others.

In describing the impact of health IT on organization of work and workflow, a discussion of the following topics would provide valuable information for small and medium size practices or clinics:

- Support that was available during the health IT implementation (e.g., additional staff, overtime, additional time to complete tasks, technical support, internal versus external support).

- Training provided to the users including the duration of the training (e.g., number of days of training per end user), and the methods used to train users (e.g., ‘train-the-trainer’, super users, lecture, hands-on training).
- Discussion of successful or unsuccessful interfacing of the health IT application(s) is/are interfaced with each other and/or other IT, such as IT applications of ancillary services (e.g., lab system).
- Discussion of any formal evaluation of the health IT implementation was conducted and any measures used for the evaluation (e.g., impact on job satisfaction, efficiency, workload, decision making accuracy, quality of care, cost).

In assessing the implementation of health IT, comments about the impact of particular health IT applications on different domains of a practice or clinic are requested. Thus, we would appreciate comments on how health IT has impacted or supports:

- Communication among practice or clinic staff (e.g., physician, nurse, medical assistant, physician assistant, receptionist, technician)
- Coordination of care among practice or clinic staff (e.g., physician, nurse, medical assistant, physician assistant, receptionist, technician)
- Information flow between the practice or clinic and external healthcare organizations (e.g., community pharmacies, imaging centers, local hospitals)
- Clinicians’ work during patient visit
- Clinicians’ thought processes as they care for patients.
- Access to patient-related information

#### Additional Submission Instructions

Responders should identify any information that they believe is confidential commercial information. Information reasonably so labeled will be protected in accordance with the FOIA, 5 USC 552(b)(4), and will not be released by the agency in response to any FOI requests. It will not be incorporated directly into any requirements or standards that the agency may develop as a result of this inquiry regarding useful tools or information for small- and medium-sized medical practices regarding implementation of health information technology in such practices.

Dated: June 17, 2009

Carolyn M. Clancy, M.D.  
AHRQ, Director