

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.

References

1. Bates DW, Cohen M, Leape LL, et al. Reducing the frequency of errors in medicine using information technology.[see comment]. *J Am Med Inform Assoc* 2001;8(4):299-308.
2. Kho AN, Dexter PR, Warvel JS, et al. An effective computerized reminder for contact isolation of patients colonized or infected with resistant organisms. *Inl J Med Inform* 2008;77:194-8.
3. Shea S, DuMouchel W, Bahamonde L. A meta-analysis of 16 randomized controlled trials to evaluate computer-based clinical reminder systems for preventive care in the ambulatory setting. *J Am Med Inform Assoc* 1996;3(6):399-409.
4. Potts AL, Barr FE, Gregory DF, et al. Computerized physician order entry and medication errors in a pediatric critical care unit. *Pediatrics* 2004;113(1 Pt 1):59-63.
5. Mekhjian HS, Kumar RR, Kuehn L, et al. Immediate benefits realized following implementation of physician order entry at an academic medical center. *J Am Med Inform Assoc* 2002;9(5):529-9.
6. Kuperman GJ, Gibson RF. Computer physician order entry: benefits, costs, and issues. *Ann Intern Med* 2003;139(1):31-9.
7. King WJ, Paice N, Rangrej J, et al. The effect of computerized physician order entry on medication errors and adverse drug events in pediatric inpatients. *Pediatrics* 2003;112(3 Pt 1):506-9.
8. Kaushal R, Shojania KG, Bates DW. Effects of computerized physician order entry and clinical decision support systems on medication safety: a systematic review. *Arch Intern Med* 2003;163(12):1409-16.
9. Kaushal R, Bates DW. Computerized physician order entry (CPOE) with clinical decision support systems (CDSSs). In: Shojania KG, Duncan BW, McDonald KM, et al., eds. *Making Health Care Safer: A Critical Analysis of Patient Safety Practices. Evidence Report/Technology Assessment No. 43* (Prepared by the University of California at San Francisco–Stanford Evidence-based Practice Center under Contract No. 290-9700013), AHRQ Publication No. 01-E058, Rockville, MD: Agency for Healthcare Research and Quality. July 2001. p. 59-69.
10. Kaushal R, Jha AK, Franz C, et al. Return on investment for a computerized physician order entry system. *J Am Med Inform Assoc* 2006 May-Jun;13(3):261-6.
11. Shamliyan TA, Duval S, Du J, et al. Just what the doctor ordered. Reivew of the evidence of the impact of computerized physician order entry system on medication errors. *Health Serv Res* 2008;43(1):32-53.
12. Koppel R, Wetterneck TB, Telles JL, et al. Workarounds to barcode medication administration systems: occurrences, causes and threats to patient safety. *J Am Med Inform Assoc* 2008;15:408-28.
13. Patterson ES, Cook RI, Render ML. Improving patient safety by identifying side effects from introducing bar coding in medication administration. *J Am Med Inform Assoc* 2002 Sep-Oct;9(5):540-53.
14. DesRoches CM, Campbell EG, Rao SR, et al. Electronic health records in ambulatory care - a national survey of physicians. *N Engl J Med* 2008 Jul;359(1):50-60.
15. Furukawa MF, Raghu TS, Spaulding TJ, et al. Adoption of health information technology for medication safety in U.S. hospitals, 2006. *Health Aff* 2008 May-Jun;27(3):865-75.
16. Jha AK, DesRoches CM, Campbell EG, et al. Use of electronic health records in U.S. hospitals. *N Engl J Med* 2009 Apr;360(16):1628-138.
17. Pedersen CA, Gumpfer KF. ASHP national survey on informatics: assessment of the adoption and use of pharmacy informatics in US hospitals-2007. *Am J Health Syst Pharm* 2008 Dec;65(23):2244-64.
18. Hsiao C-J, Beatty PC, Hing ES, et al. Electronic medical record/electronic health record use by office-based physicians: United States, 2008 and preliminary 2009. Available at: Centers for Disease Control and Prevention, National Center for Health Statistics. http://www.cdc.gov/nchs/data/hestat/emr_ehr/emr_ehr.pdf. Accessed January 7, 2010.
19. Linder JA, Ma J, Bates DW, et al. Electronic health record use and the quality of ambulatory care in the United States. *Arch Intern Med* 2007 Jul;167(13):1400-5.
20. Zhou L, Soran CS, Jenter CA, et al. The relationship between electronic health record use

- and quality of care over time. *J Am Med Inform Assoc* 2009 Jul-Aug 16(4):457-64.
21. Himmelstein DU, Wright A, Woolhandler S. Hospital computing and the costs and quality of care: a national study. *Am J Med* 2010;123(1):40-6.
 22. Ash J, Anderson NR, Traczy-Hornoch P. People and organizational issues in research systems implementation. *J Am Med Inform Assoc* 2008;15(3):283-9.
 23. Berlin A, Sorani M, Sim I. A taxonomic description of computer-based clinical decision support systems. *J Biomed Inform* 2006;39(6):656-67.
 24. Shiffman RN, Michel G, Essaihi A, et al. E. Bridging the guideline implementation gap: a systematic, document-centered approach to guideline implementation. *J Am Med Inform Assoc* 2004;11(5):418-26.

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. 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,
website of the project on “Incorporating Health Information Technology Into Workflow
Redesign”: 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