Health Information Technology: Integration of Clinical Workflow into Meaningful Use of Electronic Health Records

by Felicia M. Bowens, MSM; Patricia A. Frye, MPH, MPA, DrPH; and Warren A. Jones, MD, FAAFP

Abstract

This article examines the role that clinical workflow plays in successful implementation and meaningful use of electronic health record (EHR) technology in ambulatory care. The benefits and barriers of implementing EHRs in ambulatory care settings are discussed. The researchers conclude that widespread adoption and meaningful use of EHR technology rely on the successful integration of health information technology (HIT) into clinical workflow. Without successful integration of HIT into clinical workflow, clinicians in today's ambulatory care settings will continue to resist adoption and implementation of EHR technology.

Key words: electronic health record (EHR), health information technology (HIT), clinical workflow, productivity, meaningful use, ambulatory care

Introduction

Recent studies show that the adoption of health information technology (HIT) across care settings can lead to greater efficiency, better access to quality healthcare, and patient safety.[1–7] Studies show that implementation of HIT may improve health outcomes, reduce medication errors, augment chronic disease management, reduce health disparities, and offer substantial cost savings.[8–18] Despite these benefits, clinicians continue to be reluctant to integrate health information technologies such as electronic health records (EHRs) into ambulatory care settings, as shown in Table 1. Studies report that clinicians have concerns over the potential effects of HIT on clinical workflow and productivity.[19–22] This article examines whether EHR technology can be seamlessly integrated into clinical workflow in ambulatory care settings in a meaningful way. Specifically, this article addresses issues related to barriers hindering HIT implementation, the prospective benefits of HIT adoption, and the important role clinical workflow plays in successful implementation and meaningful use of EHRs in ambulatory care.

Background

In recent years, the healthcare industry has seen a widespread effort to move the nation toward use of interoperable health information technologies. Emphasis has been placed on the adoption of a national health information exchange network by 2014.[23] Literature has indicated that implementation of

technologies such as EHRs can offer numerous benefits for both patients and clinicians. The adoption and implementation of EHRs can transform delivery of patient care, improve patient outcomes, and improve patient safety by reducing medical mistakes and preventing unwarranted surgical procedures.[24–30] Successful implementation of EHRs may lessen health disparities, reduce prescription drug errors, and provide substantial cost savings by reducing wasteful spending and reducing unnecessary duplication of procedures.[31–41] Movement toward widespread adoption, however, has been relatively slow.[42] Current research shows that between 2008 and 2009, approximately 4 to 6 percent of clinicians nationwide were estimated to be utilizing a "fully functional" EHR system that encompassed health information data, order-entry management, results management, and clinical decision support,[43–48] while an estimated 13 to 20.5 percent of clinicians currently use "basic" EHR systems that include minimal features such as patient data and prescription ordering.[49–53] Studies document that cost, lack of funding, physician resistance, fear of change, loss of revenue, lack of vision, privacy and confidentiality concerns, physicians' apprehension over return on investment, and worries over time investment are among the many obstacles that impede EHR adoption.[54–60] While cost, lack of funding, and concerns over privacy and security are important barriers to overcome, EHR adoption ultimately rests on the removal of physician resistance.[61] Research shows that clinicians heavily weigh the potential effects of EHRs on routine workflow.[62, 63] Consequently, movement toward full EHR implementation has not been realized across ambulatory care settings. The integration of EHR technology into routine clinical workflow has become an emerging research topic within the fields of health information technology and health information management.

Integration of Clinical Workflow

Increasingly becoming recognized as an essential component to successful integration of EHR technology in ambulatory care, clinical workflow is often characterized in terms of the pattern of actions clinicians utilize to perform routine tasks and generate results.[64–66] Clinical workflow encompasses a wide range of tasks, as shown in Table 2.[67] As stated by Leu et al., "Understanding the full clinical context for health IT to the level of task, resources, and workflow is a necessary prerequisite for successful adoption of health IT and measurement of its diffusion."[68]

It is reasonable to expect that clinicians working through the complexity of these diverse tasks may have concerns over EHR implementation and the potential impact it may have on routine workflow and productivity. Nevertheless, with the enactment of the "meaningful EHR user" provisions established within the American Recovery and Reinvestment Act of 2009 (ARRA) and the "meaningful use" criteria proposed by the Centers for Medicare and Medicaid Services (CMS), clinicians must now contemplate how "meaningful use" plays a role in the overall integration of EHR technology into ambulatory care settings.[69, 70] To be recognized as "meaningful EHR users," clinicians must move toward the demonstration of three fundamental criteria framed by specifications established in the ARRA.[71] According to these criteria, clinicians must demonstrate that they are

- using certified EHR technology including electronic prescribing in a substantial way,
- exchanging health information, and using data exchanged to advance the quality of healthcare delivery, and
- reporting clinical measures.

These criteria lay the foundation for the connection between successful EHR implementation and meaningful application of EHR technology.[72]

Be that as it may, for meaningful application of EHR technologies to become apparent, EHR implementation in ambulatory care settings has to produce minimal interference with clinical workflow.[73] As reported by Lorenzi et al., EHR implementation encompasses a number of stages, as shown in Figure 1.[74] Within each stage, clinicians have the painstaking task of developing strategies to address latent

issues that may impede workflow before, during, and after implementation.[75] In various surveys of clinicians with EHR systems, clinicians expressed a number of concerns relevant to EHR implementation and workflow. Among these concerns are difficulty selecting the type of EHR equipment and the level of functionality necessary to incorporate the EHR system into clinical practice, maneuvering through the different interface templates and forms, and inputting data into an EHR system while interacting with patients.[76, 77] These areas of workflow integration are most likely to have the greatest effect on workflow dynamics. Physicians also express having trouble with management of alerts (especially false positives), capturing data in a timely fashion, and typing with skillful proficiency.[78–80] Without appropriate selection of and training on the appropriate EHR system in the transition phases, clinicians run the risk of having the EHR system negatively impact workflow and productivity.[81]

Nonetheless, clinicians can undertake various approaches to ensure incorporation of clinical workflow into EHR technology at the onset of implementation, as shown in Figure 2. With the use of techniques such as workflow assessments and workflow diagrams, clinicians can establish appropriate procedures to ensure that EHR implementation will cause minimal disruption to workflow and productivity.[82–85] Utilizing workflow assessments in the preimplementation phase, clinicians can gain a better understanding of the various patterns that create routine workflow in their clinical settings.[86] As demonstrated in Figure 3, clinicians must consider and address various questions to fully assess and properly analyze clinical workflow. Additionally, incorporating the use of workflow diagrams, clinicians can begin to understand the blueprint that forms the workflow within their individual care settings, as illustrated in Figure 4.[87] Recognizing that each clinician's workflow pattern is unique, clinicians can utilize assessments and diagrams to help them modify their individual implementation plans.[88–90] Based on these thorough assessments, clinicians may find it necessary to redesign their internal clinical workflow processes to ensure productivity is optimized and seamless integration of EHR technology with clinical workflow is achieved.[91–93] As one study describes, EHR systems can be the catalyst that encourages clinicians to rethink workflow.[94] Employing workflow redesign, clinicians can conceivably attain outcomes that not only are advantageous for patients but also offer clinicians a return on their investment.[95] For clinicians, the standards underlying the revamping of workflow should always be focused on improving patient safety, enhancing the quality of patient data collected, enriching workflow efficiency, and improving distribution of workflow tasks.[96]

As clinicians pursue various approaches to reengineering workflow, they may use a number of technologies to interface with EHR systems in order to maximize meaningful use and optimize clinical workflow. The integration of technologies such as automated data uploads, personal digital assistants (PDAs), and voice-recognition software can offer clinicians the customized tools needed to successfully work through postimplementation changes to workflow.[97–101] Studies document that the incorporation of automated uploads of vital signs data and the use of technology such as PDAs and voice-recognition software can be used to alleviate potential lapses in productivity and workflow.[102–106] In a study conducted by Smith et al., the use of automated vital sign upload technology and PDAs was shown to improve clinical workflow in terms of recording of vital sign statistics.[107] The results suggested that the use of automated uploads and PDA technology offers clinicians an opportunity to increase vital sign data precision, reduce human inaccuracies, and improve patient well-being.[108] Similarly, a study conducted by Esper et al. implied that the use of technologies such as voice-recognition software and scanning software could also be beneficial to clinical workflow.[109] Hence, utilizing a combination of these technologies, clinicians may be able to lessen the challenge EHRs may pose to productivity and workflow. Nevertheless, if clinicians choose to utilize these technologies to minimize the impact of EHR implementation on their workflow, clinicians will require proper training for the technologies to be effortlessly integrated into clinical workflow in a meaningful way.[110]

In order to successfully implement HIT in ambulatory care settings, clinicians must also examine how organizational dynamics such as leadership and change management may impact the successful integration of EHR technology with the clinical workflow.[111, 112] Outside of workflow redesign, EHR

implementation necessitates that clinicians rethink internal organizational elements that can significantly influence EHR success.[113] Research shows that the addition of a champion within the organization to engage and educate clinical staff on the long-term advantages of an EHR system to routine workflow is a vital element of successful implementation.[114–116] The fundamental role of the EHR champion is to promote the benefits of EHR systems for the workflow, including improvements to workflow efficiency, enhancement of patient safety, and improvements to delivery of care.[117, 118] Research shows that in addition to establishing EHR champions, change management is also an important element for achieving successful integration of EHR technology into the clinical workflow.[119–121] In order to support EHR success, change management must be a collaborative effort among EHR champions and clinical staff.[122, 123] As the leader of change, the EHR champion must engage staff and seek continuous feedback from staff throughout the implementation process.[124] Recognizing and, when appropriate, acting on the comments of clinical staff, the champion can develop strategies to quickly address issues or concerns that may occur to ensure productivity remains high and the workflow remains efficient.[125]

Conclusion

The widespread adoption of EHR technology across ambulatory care settings is likely to occur in the near future. EHR systems will eventually become a central tool of common practice among clinicians nationwide.[126] Nonetheless, the road to adoption remains slow, as clinicians continue to work toward successfully integrating significant and meaningful use of EHRs into the clinical workflow. With the passage of healthcare reform and the Health Information Technology for Economic and Clinical Health (HITECH) Act, the landscape in which clinicians operate is steadily changing. The integration of HIT into ambulatory care is inevitable; thus, clinicians in ambulatory care settings have to move beyond concerns over disruptions to clinical workflow. Instead, clinicians have to embrace the potential long-term benefits that EHRs present for the overall improvement of healthcare quality and must search for ways to infuse EHR technology into routine workflow. Nonetheless, successful integration of EHR technology into clinical workflow will require synergy between multiple approaches.

Felicia M. Bowens, MSM, is project manager of the Health Information Technology Core for the University of Mississippi Medical Center's Institute for Improvement of Minority Health and Health Disparities in the Delta Region in Jackson, Mississippi.

Patricia A. Frye, MPH, MPA, DrPH, is Director of the Evaluation Core for the University of Mississippi Medical Center's Institute for Improvement of Minority Health and Health Disparities in the Delta Region in Jackson, Mississippi.

Warren A. Jones, MD, FAAFP, is a professor of family medicine and professor of anesthesiology at the University of Mississippi Medical Center and the Executive Director of the Institute for Improvement of Minority Health and Health Disparities in the Delta Region in Jackson, Mississippi.

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Notes

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Table 1

Projected Benefits and Potential Barriers of HIT Implementation

Projected Benefits	Potential Barriers
Increased quality of healthcare	Initial cost
Reduction of medication errors	Physician resistance
Improvement of patient health outcomes	Lack of funding
Reduction in health disparities	Fear of change
Cost savings	Privacy and security
Improved patient safety	Concerns of return on investment
Augmented chronic disease management	Lack of vision

Table 2

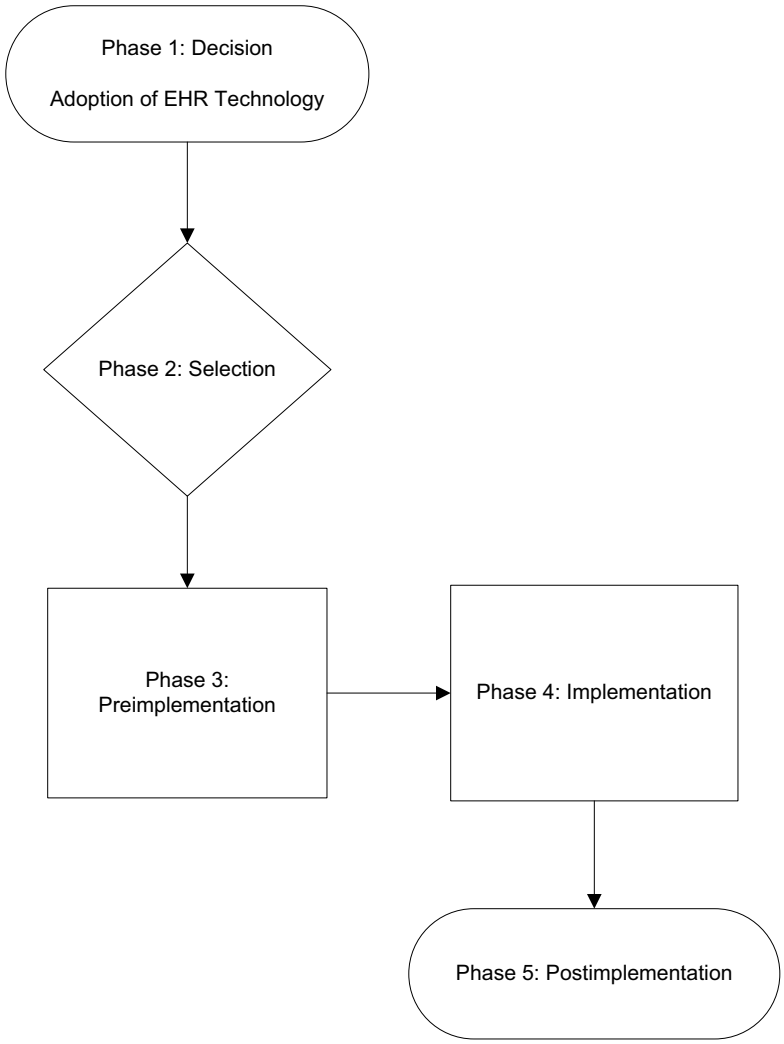
Clinical Workflow Tasks

Administrative	Clinical
▪ Schedule appointments ▪ Document patient information ▪ Retrieve and store patient medical records ▪ Process billing and claims ▪ Communication	▪ Medical treatment (triage) ▪ Record patient history ▪ Examine and assess patients ▪ Develop treatment plans ▪ Provide patient education ▪ Prescribe medication ▪ Order procedures (e.g., vaccinations, x-rays,) and lab tests ▪ Clinical follow-up with patients

Source: Adapted from Jason Lee and Adele Shartzer. *Questions and Answer Brief: Health IT and Workflow in Small Physicians' Practices*. NIHCM Foundation, April 2005. Available at http://www.nihcm.org/pdf/AHRQ-QandA.pdf.

Figure 1

Phases of EHR Implementation



Source: Adapted from Lorenzi, Nancy M., Angelina Kouroubali, Don E. Detmer, and Meryl Bloomrosen. "How to Successfully Select and Implement Electronic Health Records (EHR) in Small Ambulatory Practice Settings." *BMC Medical Informatics and Decision Making* 9, no. 15 (2009). Available at http://www.biomedcentral.com/1472-6947/9/15.

Figure 2

Essential Elements for Successful Integration of EHR Technology, Clinical Workflow, and Meaningful Use

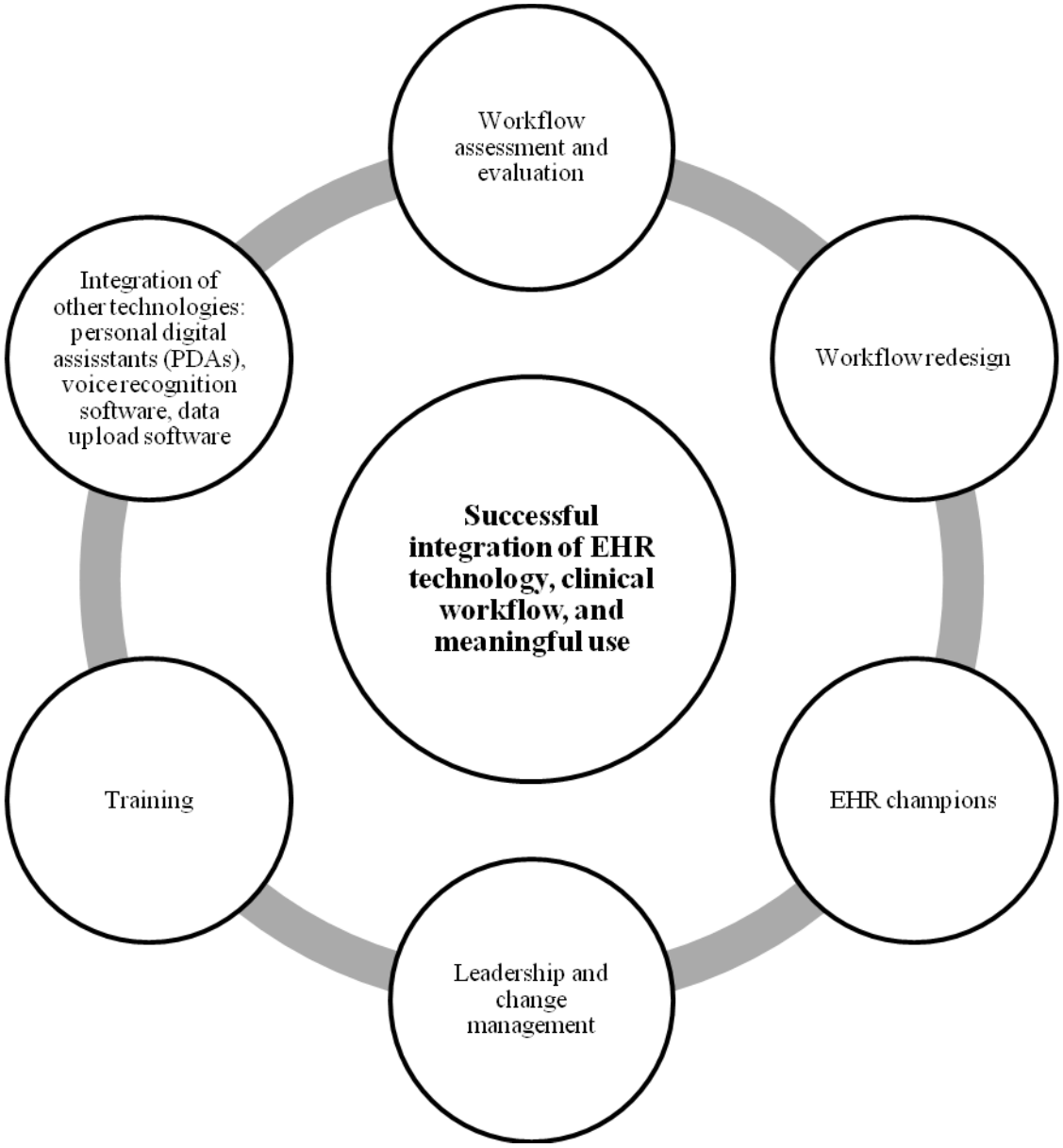


Figure 3

Sample Workflow Assessment

1. Estimate the number of patients seen in your office in a typical day.	1–10 ☐	10–20 ☐	20–40 ☐	40–60 ☐	60–100+ ☐
2. How is delivery of patient care documented?	Written ☐	Electronic ☐	Paper/Electronic ☐		
3. Estimate the length of time it takes to document patient information.	1–3 minutes ☐	3–5 minutes ☐	5–10 minutes ☐	10–15 minutes ☐	15–20 minutes ☐
4. How readily can staff generate reports about patient history, using your current medical recording methods?	Readily ☐	Somewhat readily ☐	With some difficulty ☐	With much difficulty ☐	Unable to generate ☐
5. How often does your practice evaluate clinical workflow patterns?	Monthly ☐	Quarterly ☐	Every six months ☐	Yearly ☐	Never ☐
6. What workflow areas would you like to improve in your office?	☐ Use of resources ☐ Scheduling of appointments ☐ Patient follow-up ☐ Billing ☐ Ordering procedures ☐ Maintenance/storage of patient records ☐ Ordering lab tests ☐ Documentation of patient information ☐ Other: _____ ☐ Timely review of lab results and procedures ☐ Tracking patient self-management and progress				
7. On average, how many new and refill prescriptions does your office write daily?	1–5 ☐	5–10 ☐	10–15 ☐	>15 ☐	None ☐
8. Estimate the number of lab tests ordered daily.	1–5 ☐	5–10 ☐	10–15 ☐	>15 ☐	None ☐
9. Estimate the number of procedures ordered daily.	1–5 ☐	5–10 ☐	10–15 ☐	>15 ☐	None ☐
10. How does your office receive lab and procedure results?	Fax ☐	Electronic ☐	Messenger delivery ☐	E-mail ☐	Regular mail ☐

Figure 4

Clinical Workflow Process Diagram