

ORIGINAL RESEARCH

Achieving Meaningful Use of Electronic Health Records (EHRs) in Primary Care: Proposed Critical Processes from the Kentucky Ambulatory Network (KAN)

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Objective: The Kentucky Ambulatory Network, a practice-based research network, conducted this study to propose critical processes for electronic health record (EHR) implementation.

Methods: Periodic observation of the implementation process and assessment of meaningful use (MU) metrics within 10 small primary care practices working with a regional extension center.

Results: Through focus groups and structured interviews, the strategies, processes, and procedures used by these practices to achieve MU of EHRs were determined. Implementation themes related to and critical processes associated with EHR adoption were proposed.

Conclusions: Five proposed critical processes for EHR adoption and achievement of MU were identified; these processes were supported by 70% (7 of 10) of the study practices meeting MU criteria. (J Am Board Fam Med 2014;27:772–779.)

Keywords: Computerized Medical Record Systems, Electronic Medical Records, Health Care Systems, Medical Informatics, Practice-based Research, Primary Health Care

Most primary care offices in the United States are small practices^{1,2} that often lag behind in the implementation of electronic health records (EHRs).^{3,4} In 2009, the Health Information Technology for Economic and Clinical Health (HITECH) Act was established and funded regional extension centers (RECs) to provide tech-

nical assistance, guidance, and information to support EHR implementation. RECs were specifically charged with assisting small primary care provider practices in implementing and achieving “meaningful use” (MU) of EHRs.

The Kentucky REC, housed at the University of Kentucky College of Medicine, received funding in April 2010 to provide EHR technical assistance in the Commonwealth of Kentucky. As part of the cooperative funding agreement, the Kentucky REC received funds to study EHR implementation in the Kentucky Ambulatory Network (KAN), a practice-based research network (PBRN) based at the University of Kentucky. This was the only study of the process of achieving MU of EHRs in primary care included in REC funding awards. KAN membership includes more than 350 community-based clinicians practicing in small primary care practices or health centers throughout Kentucky. These practices serve a Kentucky population that fares worse than most for many health care indicators, as well as some of the most rural and lowest-income counties in the nation.⁵ For example, Kentucky has

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routinely led the nation in high smoking rates among adults, pregnant women, and youth, as well as the health effects associated with cigarette smoking.⁶

Strategies for successful implementation of EHRs are of current interest because attainment of MU of EHRs is tied to incentive payments from Medicare and Medicaid. A number of authors have identified or created lists of strategies for successful implementation of EHRs. A literature review of 47 articles published from 2000 to 2011 identified 10 elements important to EHR implementation success.⁷ As RECs began grant start-ups in 2010, the National Committee on Quality Assurance compiled lessons learned in EHR implementation from already existing initiatives.⁸ Another article identified factors associated with successful EHR implementation by interviewing EHR implementation specialists and measuring time of EHR implementation.⁹ Articles in the gray literature often highlight “how-to” tips and suggestions from the authors’ personal experience and research.^{10–12}

Though several suggested “best practices” and “lessons learned” during EHR implementation are emerging in the literature and professional publications, many are proposed without assessing whether specific metrics were accomplished. Defined by the Centers for Medicare and Medicaid Services, MU of EHRs includes a standard set of metrics with the overarching goals of improving quality, safety, and efficiency and reducing disparities; engaging patients and family; improving care coordination and population health; and maintaining the privacy and security of patient health information.¹³ MU essentially establishes a new definition for the successful implementation and use of EHRs. This study differs from previous studies because it takes a process outcome perspective by (1) collecting longitudinal data from physicians and staff as they implemented an EHR in their office and (2) using attainment of MU as a measure of successful EHR implementation.

The purpose of this longitudinal assessment of primary care practices working with a REC to attain MU was to identify critical processes for successful EHR implementation through periodic observation of the implementation process and assessment of the outcome (attainment of MU). We specifically sought to (1) determine the strategies, processes, and procedures used by small primary care practices working with a REC to achieve meaningful use of EHRs, (2) describe opportuni-

ties, barriers, lessons learned, and critical processes associated with EHR adoption, and (3) assess practices’ progress toward attaining MU metrics.

Methods

The study was conducted October 2010 to May 2012. Ten small primary care practices in Kentucky were recruited to participate. All had current agreements to work with the Kentucky REC and had less than 2 months of REC assistance when recruited. Practices were purposefully chosen to include those with a range of EHR experience: from total paper records to those with years of EHR experience. The study participants included 1 physician and 1 staff member from each of the 10 practice sites.

Our mixed methods approach included focus groups, structured interviews, and direct observation of EHR MU reports. For each practice, a baseline site visit was conducted by a KAN research nurse to record practice characteristics and plans for EHR implementation and MU achievement. To receive MU incentives during the study period, eligible providers were required to meet 20 defined measures grouped in 2 categories: 15 core measures and 5 menu measures (Table 1).

Up to 3 follow-up visits with each practice were conducted. During a follow-up visit, the research nurse administered a structured interview with a physician and a staff member from the site. The structured interview was used to capture information on barriers encountered and lessons learned during activities conducted toward satisfying MU criteria. Attaining MU was assessed by direct observation of the EHR MU report by the research nurse during each of these visits; individual MU objective criteria met were recorded.

Finally, 2 focus groups were convened. During each focus group session, one or both participants from each of the 10 participating practices engaged in a facilitated dialog with other participants on the lessons learned and critical processes regarding achieving meaningful use of EHRs in the participants’ primary care practices. The first focus group was conducted soon after each practice joined the study and completed the baseline interview. The second focus group was conducted several months later, after practices had more experience working with the REC. To ensure internal validity, the themes were shared with participants to determine whether they captured the essence of the partici-

pants' responses. To increase the reliability of our findings, the comments and qualitative output of the focus groups and structured interviews were processed and summarized independently by 2 of the authors (KGS and AOJ) using the constant comparison coding method to distill these inputs into concise themes.¹⁴

Results

At initial enrollment, 7 practices had previous experience with an EHR, ranging from 4 months to 9 years of previous use. One practice was transitioning to a new system within the next 0 to 3 months because their existing system (20 months experience) was not certified for MU. Three practices had not implemented an EHR. Two of these practices planned to implement an EHR within 4 to 7

months, and 1 planned to implement an EHR within 8 to 12 months.

The average weekly number of patient visits for individual providers in each practice ranged from 80 to 160. Practice specialties included family medicine, general medicine, internal medicine, and pediatrics. Practices planned to spend between 0 and 45 hours/week on their MU goals; 40% planned to spend 10 hours or less, and 60% planned to spend >10 hours/week.

Attaining MU

For the purposes of this study, attaining MU stage 1 status involved meeting all 15 core objectives and at least 5 menu objectives, including at least 1 designated public health measure (Table 1). Of the 10 study practices, 7 achieved $\geq 85\%$ attainment of

Table 1. Meaningful Use Stage 1: Core Objectives and Menu Objectives

Core Objectives (Practices Achieving Objective)	Menu Objectives (Practices Achieving Objective)
1. Use computerized order entry for medication orders (n = 8)	1. Implement drug formulary checks (n = 8)
2. Implement drug–drug and drug–allergy checks (n = 8)	2. Incorporate clinical lab test results into certified EHR as structured data (n = 5)
3. Electronically generate and transmit permissible prescriptions (n = 8)	3. Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, and outreach (n = 8)
4. Record demographics (n = 8)	4. Send reminders for preventive/follow-up care to patients per patient preference (n = 5)
5. Maintain an up-to-date problem list of current and active diagnoses (n = 7)	5. Provide patients with timely electronic access to their health information (including lab results, problem list, medication lists, allergies) (n = 5)
6. Maintain active medication list (n = 8)	6. Use certified EHR to identify patient-specific education resources and provide to patient if appropriate (n = 6)
7. Maintain active medication allergy list (n = 8)	7. Perform medication reconciliation when relevant (n = 6)
8. Record and chart changes in vital signs (n = 8)	8. Provide summary care record for transitions in care or referrals (n = 5)
9. Record smoking status for patients ≥ 13 years old (n = 8)	9. Capability to submit electronic data to immunization registries and actual submission* (n = 6)
10. Implement one clinical decision support rule (n = 7)	10. Capability to provide electronic syndromic surveillance data to public health agencies and actual transmissions* (n = 3)
11. Report ambulatory quality measures to CMS or the state (n = 7)	
12. Provide patients with an electronic copy of their health information upon request (n = 8)	
13. Provide clinical summaries of each office visit to patients (n = 8)	
14. Capability to exchange key clinical information electronically among providers and patient-authorized entities (n = 6)	
15. Protect electronic health information (privacy and security) (n = 7)	

Core and Menu objectives can be found at <http://www.healthit.gov/providers-professionals/step-5-achieve-meaningful-use-stage-1>.

*Menu objective 9 or 10 was required as a public health objective.

CMS, Centers for Medicare and Medicaid Services; EHR, electronic health record.

MU stage 1 objectives during the study period, including 3 sites that met all required core and menu objectives. Of the 3 remaining sites, 1 practice experienced a change of leadership and postponed EHR implementation, 1 practice was in the early stages of EHR selection, and 1 practice had just begun implementation at the end of the study.

All 15 core measures were met by 50% of the participants. The least frequently achieved core measure was measure 14, "Capability to exchange key clinical information electronically among providers and patient authorized entities." The most frequently achieved menu objectives were objectives 1, "Implement drug-formulary checks," and 3, "Generate lists of patients by specific conditions to use for quality improvement, reduction of disparities, research, and outreach." The least frequently chosen and achieved menu objective was 10, "Capability to provide electronic syndromic surveillance data to public health agencies and actual transmission."

Themes from the Focus Groups and Structured Interviews

Eight themes regarding individual practice experience toward selecting and implementing an EHR and meeting MU criteria emerged from the focus group discussions and structured interviews.

The cost of moving to an EHR is high in terms of money and time. Total capital investment costs of an EHR include hardware, software, connections, a clearinghouse (if used), phone lines, and other charges. Participants recommended a comprehensive estimation of start-up costs and warned that third-party interfaces can increase cost. The operational costs most frequently mentioned were training and productivity. Hiring practice personnel with additional skills or training for existing personnel may be needed. Practices that had implemented EHRs noted a significant initial decrease in productivity. One practice related an increase of 3 to 8 minutes per patient visit after EHR implementation. Participants noted that maintenance costs are ongoing. Even so, participants found value in moving to an EHR and stated that the benefits outweighed the cost. Participants agreed that even a poorly executed or supported EHR was better than solely paper-based records. Some practices were able to recoup the initial financial outlay with MU stage 1 incentive funds.

Participants agreed that *information technology (IT) support is a challenge for everyone*. Having an

onsite IT team may not be feasible for small offices, but having responsive local IT staff was recommended. Having EHR "super-users" on staff for troubleshooting and training was highly recommended. Participants specifically suggested designating personnel to check the status of the system at least daily to avoid data loss and to frequently review reports to determine whether any user or technical issues that can be addressed promptly are present.

Careful and extensive planning is essential. Participants recognized that choosing an EHR vendor should not be rushed. REC assistance was notably beneficial to practices when planning to move to an EHR. The REC answered questions, helped formulate questions for vendors, and helped practices connect with other practices using various EHR systems. Participants suggested formulating realistic timetables then sticking to them. Planning a change in scheduling (decreased throughput) to accommodate the transition period was recommended for a less stressful experience and smoother transition.

Implementing an EHR is a team effort. Incorporating staff with diverse departmental backgrounds on the implementation team, even in small practices, was recognized as important. Specifically, participants suggested including representatives from billing, IT, clinical, and risk management. Designating a team leader who is empowered to push forward the journey toward meeting MU objectives was recommended.

Understand the workflow of the entire office. Participants regarded mapping the workflow of the office as a critical first step. Initially, information about current workflows and practical aspects of practice management is needed to perform an accurate needs assessment. This knowledge makes it much easier to formulate lists of requirements for an EHR and helps narrow the initial choices, saving time and money. Participants found that paper workflows seldom matched electronic workflows. Participants suggested changing paper workflows to match the electronic ones before implementation to work out any unforeseen difficulties and to reduce the burden of change during the initial implementation. Changes in workflows may be difficult initially but result in efficiencies for the practice.

Training is key. Participants agreed that the importance and format of training is critical. Onsite

training was preferable to web-based training. Webinars may be convenient for the vendor but may not have the utility of onsite sessions. Practices should develop a training program because system upgrades and staff turnover require ongoing training. Sending representatives to vendor users' conferences and networking with others using the same system were recommended as educational and networking opportunities.

A benefit of EHR implementation was the capability to generate reports that were not easily available from paper-based systems. However, participants did not find generating reports to be an intuitive process; they recommended determining the reports needed and requesting onsite training for how to generate reports during the initial training. This ensures the data collection system and methods are compatible with practice needs and saves frustration later. Uniform data entry across the practice aids in reporting and meaningful use and was an issue for several practices. As practices became adept at generating reports, they began to understand the gains possible in quality improvement and used this function frequently.

Vendor support and communication is vital. Participants described the EHR marketplace as overwhelming. Practices needing to choose a new EHR stated that the REC was an excellent resource to help save time and money during the process. Participants noted that data integrity is a function not only of training and planning but also of ongoing vendor communication. MU requires interoperability with other systems such as laboratories, immunization registries, and e-prescribing systems, which require the vendor's technical knowledge. Determining whether an interface will be needed to communicate with existing systems is important because these usually increase the cost and complexity of the system.

Finally, *networking with other users is important.* Networking with other users of the same EHR was valuable for both clinicians and managers of small practices. Networking before signing a contract with a vendor was helpful to narrow the available EHR options based on the experiences of others. The REC often identified similar practices using top candidate EHR systems. Shadowing similar practices using top candidate systems provided a unique perspective of usability and "fit." After EHR implementation, continuing to network with others

using the same system was noted to be beneficial as an adjunct to vendor support.

From these 8 themes, 5 critical processes for choosing, implementing, and achieving MU criteria for EHRs were identified (Table 2).

Discussion

All practices considering implementation of an electronic EHR face challenges. Although it has been estimated that 78% of office-based physicians have some type of EHR system,¹⁶ few have the capability to meet MU criteria.^{15–17} Andrews and colleagues¹⁸ found that PBRN physician interest in electronic EHR systems was high, yet barriers, including cost, prevented practices from adopting key technologies.

Identifying efficient and effective practices for dealing with the significant changes inherent in EHR adoption and MU attainment is particularly important for small practices with limited resources. From our study of 10 primary care practices experiencing the challenges of meeting MU stage 1 criteria, 5 critical processes for successful EHR adoption and achievement of MU were identified: (1) recognize that deliberate, careful, and timely planning is required for choosing an EHR system and vendor and achieving MU; (2) designate a team leader and build the right implementation team; (3) understand your workflow and how it will change with an EHR; (4) devote resources to initial and ongoing training; and (5) understand the resources needed for success (Table 2). These critical processes are the culmination of what worked for these primary care practices as they experienced the challenges and successes of meeting MU stage 1 criteria.

To our knowledge, this study is the first to concurrently record quantitative attainment of MU as a measure of successful EHR implementation and include that factor in development of the proposed critical processes. In addition, this study of small primary care practices reflects the voice of PBRN members during the actual process of adopting, implementing, and using EHRs to achieve MU.

One interesting observation during this study was the varying achievement of MU objectives. Once a practice met an MU objective, there was no guarantee the same objective would be met at the next observation period. For MU stage 1, practices were required to attest to attainment of MU for a

Table 2. Critical Processes for Successfully Adopting an Electronic Health Record (EHR) and Implementing and Achieving Meaningful Use of EHRs

Recognize that deliberate, careful, and timely planning is required for choosing an EHR system and vendor and for achieving MU.	<ul style="list-style-type: none"> • Use your peer network to aid in decision making. Shadow users at similar practices that have adopted the candidate systems. Ask about customer support, upgrades, etc. • Invite top candidates to set up their system in your office for a few weeks' trial side by side. Dedicate time for the implementation team to "test drive" the systems. • Formulate realistic timetables and hold potential vendors to them. • Plan for a significant initial slowdown in patient throughput and possibly as the new standard for some practices over the long term. • Monitor reports to ensure uniform data collection to guide MU efforts.
Designate a team leader and build the right implementation team.	<ul style="list-style-type: none"> • Include representatives from all areas, such as billing, IT, clinical, and risk management. • Designating an empowered team leader is invaluable to help stay focused and achieve results. • Recognize that changes in the practice team can affect drive for MU. • Invite a trusted resource with experience in implementation, such as the REC, to help navigate the process.
Understand your workflow and how it will change with an EHR.	<ul style="list-style-type: none"> • Understand your current process before you decide on a specific EHR. • Optimize workflow processes. A poor process on paper will not become efficient just because it is electronic. • Change your workflow in the existing system before you implement the new electronic system. • Creating and generating reports are not easy but are extremely useful for monitoring quality improvement.
Devote resources to initial and ongoing training.	<ul style="list-style-type: none"> • Develop training tailored to your practice needs. • Do not confuse intensity of training with its utility, particularly with webinars. • Schedule short training sessions specific to the needs of the office because they are easier to manage in terms of scheduling and retaining information. • Request on-site trainings and, when possible, make arrangements for video capture for future use. • Develop and implement a continuous training program specific to the EHR.
Understand the resources needed for success.	<ul style="list-style-type: none"> • Recognize start-up and ongoing costs associated with the EHR. • Network to identify other users. This is helpful both in the initial decision-making stage and for ongoing mutual help, such as shared training. • Understand that EHR adoption may require changes in the skills and duties of clinical staff. • Secure legal counsel for contractual arrangements. • Increased need for general IT support and system specialists; have at least one "super-user" on staff.

IT, information technology; MU, meaningful use; REC, regional extension center.

90-day period; the time frame is extended to 1 year for later MU time frames. Maintaining MU objectives consistently over a longer term requires diligence in monitoring and training that may be an additional challenge for some practices.

Ongoing research funded by the Agency for Health Care Research and Quality to "inform MU policy and practice implementation" highlights the importance of understanding what works for small primary care practices as they strive to attain the promise of improved quality of care and practice efficiencies that EHRs purport to bring. The EHR journey for small practices is far from over; MU stage 2 is now operational and stage 3 criteria have been drafted. Early reports from those implementing stage 2 are that more complex, individualized decisions are required for practices to achieve MU.

Recognizing that small physician practices often lag behind in the adoption of EHRs, REC programs were funded to specifically support those practices. RECs helped bridge the gaps for small primary care practices by providing services and expertise to help those practices navigate the decisions required to implement, adopt, and use EHRs.

As the MU focus shifts from capturing and sharing data in stage 1 to advancing clinical processes and improving outcomes in stages 2 and 3, the challenges change but do not diminish. RECs are perfectly positioned as trusted partners to offer ongoing assistance to practices by providing training and support for managing organizational change. Education and training are at the heart of REC services; however, HITECH funding for RECs has ended. Although one of the goals of

HITECH funding was the sustainability of RECs, the number of RECs that achieve that goal remains to be determined.

Limitations

The results of this study may not be externally generalizable to other organizations, locations, or situations. In addition, larger organizations may experience different implementation obstacles and have larger resources at their disposal to overcome them. The critical processes identified are weighted toward initially choosing and implementing an EHR because of the adoption stage of the study practices. Therefore, the set of critical processes reported here may not fully align with those needed for later stages of MU.

Conclusion

This study is unique because it follows 10 small primary care practices in Kentucky that are planning transitions to a certified EHR and meeting MU criteria to receive stage 1 incentive payments. All practices noted that implementing an EHR is a lengthy, complicated, and costly process. All participants received services from the Kentucky REC and found this assistance to be invaluable. We believe the themes and critical processes proposed in this study may be useful to other primary care practices in the adoption of EHRs and attainment of MU criteria. Future research should explore the applicability of the critical processes with a larger number of physician practices, in physician practices with different demographics, and in future stages of MU.

This is a transitional time in health care. Meeting MU stage 1 criteria was the outcome for practices included in this study, but is not the ultimate goal for practices transforming care delivery under health care reform. Stage 2 MU, patient-centered medical homes, the Physician Quality Reporting System, International Classification of Diseases 10th Revision, and the Health Insurance Portability and Accountability Act are a short list of programs and regulations that aim to transform clinical practice. Add ongoing EHR upgrades, payment reform, and additional patients enrolled in health benefit exchanges, and the need to identify evidence-based practices regarding EHR adoption and use becomes even more critical.

As noted recently by a REC staff member, health care providers are currently “saturated with initiatives.” At a time when increasing change is required, continued support for practices with limited resources is critical to achieve long-term, sustainable change. Without external support such as RECs, the timeline for practices to move beyond EHR implementation to the long-term goal of improving health outcomes may be delayed.

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