Are Electronic Medical Records Helpful for Care Coordination? Experiences of Physician Practices

Ann S. O'Malley, MD, MPH, Joy M. Grossman, PhD, Genna R. Cohen, BS, Nicole M. Kemper, MPH, and Hoangmai H. Pham, MD, MPH

Center for Studying Health System Change, Washington, DC, USA.

BACKGROUND: Policies promoting widespread adoption of electronic medical records (EMRs) are premised on the hope that they can improve the coordination of care. Yet little is known about whether and how physician practices use current EMRs to facilitate coordination.

OBJECTIVES: We examine whether and how practices use commercial EMRs to support coordination tasks and identify work-arounds practices have created to address new coordination challenges.

DESIGN, SETTING: Semi-structured telephone interviews in 12 randomly selected communities.

PARTICIPANTS: Sixty respondents, including 52 physicians or staff from 26 practices with commercial ambulatory care EMRs in place for at least 2 years, chief medical officers at four EMR vendors, and four national thought leaders.

RESULTS: Six major themes emerged: (1) EMRs facilitate within-office care coordination, chiefly by providing access to data during patient encounters and through electronic messaging; (2) EMRs are less able to support coordination between clinicians and settings, in part due to their design and a lack of standardization of key data elements required for information exchange; (3) managing information overflow from EMRs is a challenge for clinicians; (4) clinicians believe current EMRs cannot adequately capture the medical decision-making process and future care plans to support coordination; (5) realizing EMRs' potential for facilitating coordination requires evolution of practice operational processes; (6) current fee-for-service reimbursement encourages EMR use for documentation of billable events (office visits, procedures) and not of care coordination (which is not a billable activity).

CONCLUSIONS: There is a gap between policy-makers' expectation of, and clinical practitioners' experience with, current electronic medical records' ability to support coordination of care. Policymakers could expand current health information technology policies to support assessment of how well the technology facil-itates tasks necessary for coordination. By reforming payment policy to include care coordination, policy-makers could encourage the evolution of EMR technology to include capabilities that support coordination, for example, allowing for inter-practice data exchange and multi-provider clinical decision support.

INTRODUCTION

Poor coordination of care has negative consequences for patients and contributes to higher medical costs.[1–7] Health information technology (HIT) has the potential to improve coordination by making information electronically available at the point of care, especially if implemented widely as proposed in HIT provisions of the American Recovery and Reinvestment Act of 2009 (ARRA).[8]

Current studies on electronic medical record (EMR) effectiveness focus primarily on custom-built systems at large academic medical centers[9,10] rather than the commercial EMRs most often used by US physicians in the small to medium-sized groups that constitute the majority of practices.[11] Little information exists on whether and how commercial EMRs are used to support care coordination.

To inform the design of programs that promote EMR adoption to improve care coordination, we conducted a qualitative study of the experiences of clinicians in small or medium-sized settings using commercially available ambulatory care EMRs. We examine whether and how practices use EMRs to support coordination activities, identifying ways that current EMRs facilitate coordination and the "work-arounds" clinicians use to overcome challenges. We also identify areas for HIT to better support coordination.

METHODS

Definition of Coordination of Care. We refer to the integration of care in consultation with patients, their families and caregivers across all of a patient's conditions, needs, clinicians and settings as "coordination of care."[12,13]

The standard primary care model envisions continuity of care [i.e., between the patient and primary care physician (PCP) or team] as a necessary prerequisite for care coordination.[12] Primary care generalists, whose training and orientation emphasizes wellness and illness care across a spectrum of acute and chronic conditions, are best suited to be the clinicians who coordinate care,[12,14] sharing information and helping to integrate recommendations from other specialists into the patient's ongoing care.

The principal tasks necessary for effective care coordination are:

1. Maintaining patient continuity with the PCP/primary care team.
2. Documenting and compiling patient information generated within and outside the primary care office.
3. Using information to coordinate care for individual patients and for tracking different patient populations within the primary care office.
4. Referrals and consultations (initiating, communicating and tracking).
5. Sharing care with clinicians across practices and settings.
6. Providing care and/or exchanging information for transitions and emergency care.

Participants

We identified eligible practices within the 12 randomly selected Community Tracking Study markets across the US. These markets and their selection have been described elsewhere.[15] We supplemented this sample with practices within these markets based on referrals from state and local physician organizations (see acknowledgement statement).

In order to capture established EMR use, rather than challenges relating to initial adoption, we recruited practices with a commercial ambulatory care EMR in place for at least 2 years. We emphasized small (≤10 physicians) to medium (11–50 physicians) groups. We included at least one primary care practice per market. We also interviewed specialists, both to gain their perspective on coordinating care with generalists and because some serve as the usual clinician for a small group of patients with a particular condition that dominates their health-care needs.

For each practice, we interviewed a lead physician and a non-physician identified by the lead physician as a person most familiar with the EMR and care coordination. We completed a total of 60 interviews, including 52 respondents from 26 practices and 8 thought leaders including clinicians active in HIT efforts, and EMR vendor medical directors. Most practices had used a commercial ambulatory care EMR for over 3 years (Table 1).

Interviews and Interview Protocol

We conducted telephone interviews from January–August 2008. After screening practices to ascertain specialty, size and EMR use, a separate full telephone interview was conducted. We defined "coordination of care" (see above) at the beginning of each interview. We used semi-structured interview protocols adapted for respondent type and geared toward the research questions: (1) Do practices use the EMR to support coordination of care? (2) To what degree are practices making use of

Table 1. Respondent and Practice Characteristics

	Frequency
Respondent total	**60**
Respondent type	
Physicians	26
Others in practice (nurse, nurse practitioner, practice manager)	26
Thought leader	4
EMR vendor medical director	4
Practice characteristics (total)	**26**
Specialty type	
Primary care	15
Specialty (cardiology, hematology/oncology, Ob-Gyn, eye/ENT)	11
Single vs. multi-specialty group practices	
Single specialty practice	19
Multi-specialty group practice	7
Practice size (number of physicians)	
1–2	9
3–10	6
11–20	3
21–50	6
>50	2
EMR type	
Practice partners	4
eClinicalWorks	3
Allscripts	2
Centricity	2
ChartConnect	2
Epic	2
NextGen	2
Other[a]	9
Length of Time on EMR	
2 years	5
2–5 years	11
5+ years	10

[a]*"Other" includes one practice on each of the following EMRs: BML MedRecords Alert LLC, Ecis, Gateway Medical Management, MedEnt, Medical Informatics Engineering (MIE), Misys, PrimeClinical, WebChart and Wellford Chart Notes*

specific EMR features to accomplish specific coordination tasks and *how*? (3) What "work-arounds" are practices using when clinicians do not believe that EMRs meet coordination needs? and (4) What are the perceived advantages and limitations of EMRs for coordination? (See online Appendix for Protocols.)

Analysis

A team of two researchers conducted each interview, which lasted approximately 1 hour. Content analysis of the verbatim transcripts included reviewers developing, coming to agreement and labeling every codable 'unit of text' (a statement that conveyed a singular idea).[16,17] Transcripts were coded using these codes with ATLAS.ti software. Respondents' comments were also interpreted within the context of the full interviews.

RESULTS

Facilitators, Challenges of Current EMRs to Care Coordination and "Work-Arounds"

Commercial EMRs, as currently designed and used, both facilitate and pose challenges to care coordination. The most commonly described challenges are posed by EMRs' technical

design, lack of widespread standards for data exchange, and the time clinicians felt was necessary to invest in learning functionalities that might foster coordination.

Practices often developed "work-arounds," the use of additional manual steps that might potentially be automated, to overcome challenges in using the EMR to support coordination. In several cases, EMR vendors noted that work-arounds we observed were unnecessary because particular functionalities were in fact available, but respondent clinicians were either unaware of them or were unable to use them (e.g., because the functionality was not included in their version of the software or it was deemed too burdensome to implement). Illustrative examples of facilitators, challenges and current work-arounds are presented in Table 2 and discussed throughout this section, organized by coordination tasks.

1. Maintaining patient continuity with a primary care clinician/team

Avoiding unnecessary interruptions in the relationship between a patient and the PCP is important for coordination. To foster continuity, some practices color coded patient charts by PCP or otherwise customized the EMR display, for example, by ensuring that "the primary care clinician's name is on every screen, all the time." Some EMRs link the data field indicating the patient's usual clinician with the scheduling system to help ensure that the patient sees the same clinician whenever possible.

2. Documenting and compiling patient information

To be useful for coordination, the EMR needs to enable documentation of the patient's history and data (e.g., physical exam, laboratory tests) generated both within and outside the practice. There was general consensus that the EMR permitted more thorough and consistent documentation than paper charts. As one physician stated, "I don't see more patients at all, but the patients that I do see, I definitely see better. I have more information at every visit to make sure I'm not losing track of problems."

EMRs help with several important coordination tasks related to patient information. For example, they enable more efficient documentation of medications, including their start and stop dates, thereby facilitating medication reconciliation. EMRs' ability to automatically fill the record for a current visit with stable information collected previously (such as past medical history and family history) improves efficiency of creating encounter notes.

When there was interoperability between practices' EMRs and outside laboratory tests, the EMR facilitated documentation of test results because the structured laboratory data would appear in the EMR. However, many respondents reported a lack of interoperability with the information systems of other practices, diagnostic testing facilities, hospitals and community facilities. Practices usually relied on scanning paper documents into the EMR as PDF files, which are not searchable electronically, and thus made it difficult to query a patient list (e.g., identifying those in need of recommended tests) or to efficiently track a patient's values for particular data.

3. Using information to manage and coordinate care delivered in the primary care practice

Within the practice, the primary care team needs to access information to help assess the patient and manage and coordinate care over time, including synthesizing and incorporating other clinicians' recommendations. Primary care is also increasingly being asked to perform population-based tracking. Respondents' experiences performing these tasks with EMR support are each described below.

Access and Assess Patient Data. Clinicians reported that current EMRs' facilitate coordination within the practice by making notes legible, more organized and retrievable. One internist expressed a common sentiment that having patient information at one's fingertips makes the multiple demands that PCPs face more manageable. Describing his ability to respond to patient phone calls, he explained "You have the ability with an EMR at that moment to open the chart, check the dose, and meet patient expectations more consistently."

Manage and Coordinate. Clearly defining practice staff roles helped to maximize the EMR's benefit for management and coordination tasks. Instant messaging, e-mail and electronic "tasking" (electronic notification of tasks that need to be performed) helped prevent patient care items from "falling through the cracks" and improved efficiency.

Respondents also noted advantages of some aspects of the EMR compared to paper for more complex coordination. The problem list, which was identified by clinicians as particularly important to coordination, was often cited as an example. EMRs that allow one to sort and search the problem list (e.g., chronologically or by type) were helpful. Some clinicians included important notes in the patient's problem list, such as "experienced renal failure with ACE inhibitors," to highlight issues about which persons sharing care would need to be aware. Electronic links between the problem list and other parts of the chart containing the related care plan and notes were particularly helpful, though this capability was uncommon.

Maximizing existing EMR capabilities to overcome perceived difficulties required more time and resources than many primary care practices could afford. For example, clinicians complained that problem lists grew "exponentially" and became "cluttered with redundant and irrelevant information" as EMRs automatically listed diagnostic codes related to each new test. As a work-around, many practices manually went through a patient's problem list at each visit to remove redundancies.

Current EMRs have limited ability to capture dynamic planning and the medical decision-making process in a way that supports future coordination needs—present EMRs focus on linear (point-in-time) documentation. As one internist said, "The ability to today take an action that will prompt providers to do something in the future is an underdeveloped capacity." One thought leader explained, "EMRs were built to manage visits, and when you finish a visit you close it. Care coordination occurs over a year or more. There isn't an EMR that keeps a note open for decision support so that when things come in, or don't come in, one is alerted…"

Population-Based Tracking for Patient Panel. Identification of patients' preventive screening and chronic care tracking needs may be most efficiently conducted at the panel level (e.g., eye exams for diabetics), including for quality improvement and

Table 2. Examples of How Current Use of Existing EMRs Facilitates and Poses Challenges to Care Coordination, and Work-Arounds that Practices Use to Compensate

Coordination task	Features facilitating coordination	Usage or design aspects challenging coordination	Clinician work-arounds	Potential improvements
Maintaining patient continuity with primary care physician (PCP)/primary care team.				
Identify patient's PCP and schedule visits with same clinician/team members	• Banner in EMR lists the PCP's name	• Inconsistent attention in some practices to keep the banner updated		
	• EMR link with scheduling system, includes check box to follow-up with same clinician	• Not all EMRs have these capabilities	• Duplication of work checking separate systems to determine whether appointments are being made with the same PCP	• Linkage of scheduling and EMR systems
Documenting and compiling patient information from within and outside the PC office.				
See an overview of the patient	• Chart summary screen helps orient clinician	• Chart summary screen not available in all EMRs; may not capture assessment and plan	• Look through notes to find assessment and plan	• Summary of care plan in chart Summary screen
	• Tabs are better organized than paper chart	• Tabs can separate related information and require searching		
Document and access the patient history	• "Pull forward" capability for past medical and family history is efficient for the documenter	• Templates "too generic," not appropriate for history of present illness	• Takes longer to type history—some opt for dictation • Inappropriate use of templates can decrease usability of note	• Choice of when to use templates vs. free text needs to consider end-users
Document and access the physical exam	• Template for normal physical can save time	• Burdensome to document normal physical without EMR template	• Users over-document due to litigation fears and for protection against accusations of fraud	• Revise regulations about documenting normal exam • Tort reform
Document and access medications and allergies	• Faster to review medication list from other clinicians	• Some EMRs lack fields for why a medication was stopped • Difficult to transfer medication list between different systems	• Search old notes to find reason for prior medication decisions • Paper transmission of medication list saved as back-up	• More detailed fields in medication lists • Need uniform norm across medication databases
Document and access the problem list	• Some EMRs link problem list to relevant portions of notes/assessment and plan	• List grows "exponentially" with new tests; cluttered with redundant, irrelevant information	• "Scrub" the problem list at each visit	• Refine ability of EMR to link items in problem list to other sections of EMR
Labs and diagnostic test recognition, entry into EMR, and tracking	• Results can populate the EMR if linked to the lab (e.g., HL7)	• Some outside diagnostic tests (e.g., eye exams, mammograms) come back as a hard copy or image and are not searchable for tracking across patient panel	• Scan and upload results when no link is present or convert into structured data using software add-ons or manual entry	• Require sending facilities (e.g., diagnostic facilities) to export results in a way clinicians' EMRs can recognize

Table 2. (continued)

Coordination task	Features facilitating coordination	Usage or design aspects challenging coordination	Clinician work-arounds	Potential improvements
Incorporate patient summaries from ED, hospital, community	▪ Paper patient summary can be quickly sent to ED or hospital ▪ Interfaces enable electronic linkages across settings	▪ Discharge summaries arrive too late to outpatient practice ▪ Lack of interoperability makes bidirectional interfaces rare	▪ Faxing, mailing, scanning documents between sites	▪ Need interoperability

Using information to coordinate care within the primary care office.

Assessment and care plan, future planning	▪ Future flags, i.e., used by some to remind of future actions needed ▪ Electronic tasking allows clinicians to quickly respond to diagnostic information requiring action	▪ Prompts for future action not automated and only available when viewing patient record ▪ Technology limited in ability to capture decision-making process and future care plans (e.g., target LDL, advance directives)	▪ Review multiple prior notes ▪ Create separate list of patients needing follow-up ▪ Send self a future task or flag	▪ Expand future flags/reminder capabilities ▪ Dedicated field, e.g., for advance directives, target goals
Track progress toward goals	▪ Graphing (e.g., height/ weight) can be easier	▪ Difficult with current EMRs, no concise view of progress over time	▪ Look through old notes	▪ Management "dashboard" to assess progress along care plan
Tracking preventive and chronic care services for patient and panel	▪ Health maintenance guidelines pre-loaded ▪ Health maintenance reminders ▪ Easier for drug recalls	▪ No linkage between notes and health maintenance screen ▪ Reminders are sometimes inappropriate or "too obvious" ▪ If results are not searchable, it is difficult to identify subgroups, (e.g., diabetics missing eye exams)	▪ Turn off reminders ("alert fatigue") ▪ See labs and tests	▪ Create EMR version of the preventive services sheet that is in most paper charts ▪ See labs and tests

Referrals and consultations (initiating, communicating and tracking).

Initiate, communicate, and track referrals and consultations	▪ Referral letter capability in some EMRs ▪ Improved legibility	▪ EMRs not designed to move information between clinicians and sites; patient records inaccessible to referring and consulting clinicians ▪ Lack of e-mail integration with the EMR, either for technical reasons or due to the cost of purchasing the EMR upgrades or programming	▪ Manual faxing, mailing of referral and consultation letters and scanning of documents ▪ Clinicians need to duplicate documentation efforts by "cutting and pasting" between EMR and e-mail systems	▪ Interoperability needed
▪ Some EMRs flag receipt of information back from consultants, enabling recognition of recommendations	▪ Many EMRs lack referral tracking capability	▪ Paper tracking of referrals	▪ Need referral tracking capabilities in the EMR	

Table 2. (continued)

Coordination task	Features facilitating coordination	Usage or design aspects challenging coordination	Clinician work-arounds	Potential improvements
Sharing care with clinicians across practices and settings.				
	▪ Immediate access to patient information improves: 1. Coordination when receiving a phone call from another clinician about a patient; 2. Likelihood of pulling together information for a referral request	▪ Redundant text in notes due to "cutting and pasting," some inappropriate use of templates and repetition resulting from EMRs' automated guidance around E&M documentation and coding make it difficult to discern key information needed for shared care	▪ Either excessive time is spent trying to decipher notes to distill key information, or the note is simply deemed "not useful"	▪ Strike a balance between data standardization (necessary for interoperability), and clinical relevance of the EMR to patient care
		▪ People enter information differently, so when clinicians sharing care search the record, it is hard to find necessary information	▪ Search across multiple tabs and screens within the EMR	▪ Agreement on how and where to enter certain data elements
Providing care or exchanging information for transitions and emergency care.				
Between care settings (e.g., inpatient to outpatient)	Clinicians in integrated delivery systems can access a patient's record throughout the system	Little electronic communication between inpatient and outpatient settings outside of integrated delivery systems	Manual faxing of discharge summaries, usually arrive too late to the PCP office	Establish notification procedures and interoperability between settings

reporting. Practices often needed work-arounds to identify patients for whom particular interventions were indicated. For example, one clinician's practice lists "Coumadin Therapy" on the problem lists for patients (whose Coumadin they manage), as well as listing Coumadin in the patient's medication list, because their EMR would otherwise pull information "…on everybody taking Coumadin."

Respondents cited physician culture, the lack of financial and other incentives, technical limitations of existing EMRs and the challenges of converting third-party diagnostic results into searchable structured data as reasons for the limited use of EMRs for population-based tracking.[18] Maximizing the support of EMRs for coordination also required refining care processes and was not limited to issues around EMR design.

4. Referrals and consultations (initiating, communicating and tracking)

EMRs assist with compiling the information needed to communicate with other clinicians by phone and for generating referral or consultation letters. This benefit was limited by a lack of interoperability of most EMRs, other than those used in integrated delivery systems or multi-specialty groups. Most practices reported using scanners and fax machines rather than their EMR system for transmitting and receiving referral and consultation reports. Few EMRs reportedly have referral-tracking capability, and practices that tracked referrals in a formal way typically used paper.

Though the EMR reportedly helped clinicians compose referral and consultation letters, the temptation to copy and paste redundant data and use "generic templated text" made these letters less useful for the physicians *receiving* them. Information overload made referral/consultation letters less concise and clinically relevant than their paper predecessors and hampered coordination. As one internist said, "Separating the wheat from the chaff is a significant daily task for physicians. Too much information of low quality makes the high-priority information hard to identify."

The current emphasis on using EMRs for billing and litigation prevention also hinders coordination. The evaluation and management (E&M) documentation and coding features of current EMRs create lengthy and repetitive information that, while helpful for billing, is not clinically relevant.[19] One physician reported, "Physicians will tell me time and time again, 'My notes are a lot better as far as authenticity for billing and a lot worse at telling what goes on with a patient.' It's compliance-strong and patient-quality poor."

5. Sharing care with clinicians across practices and settings

Respondents felt that current EMRs do little to facilitate collaborative decision making among different clinicians caring for the same patient. A physician in a reportedly highly integrated system said that, even for him, "most interaction is between the individual clinician, the EMR database, and the patient. There is not nearly enough inter-provider or team communication."

EMRs should not fully replace face-to-face or phone conversations, especially for complex patients and situations. One EMR vendor chief medical officer said, "…the best way to ensure good coordination of care is for two physicians to speak with each other directly. You can't approach any technology

solution, in as complex and risky a work environment as the practice of medicine, and have it be a substitute for appropriate human interactions." As one thought leader said, "While the EMR cannot replace synchronous communication, it can be a highly effective context-rich collaboration tool...If care coordination is to be done and optimized, it can't be done without an EMR (albeit a transformed one)."

Clinicians, vendors and thought leaders highlighted the lack of financial incentives for inter-specialty coordination, noting that until reimbursement changes, care processes and EMR products will not prioritize coordination. A clinician said, "Whether a medical records system is paper or electronic, good care coordination takes time. If done electronically, it takes less time than paper, but it still takes more time than not doing it at all."

The competitive nature of the EMR market is another hurdle to electronic information exchange. As one EMR vendor noted, "... even if you want to interface, it's someone selling a similar product in the same market. Everyone talks about interoperability...but we need the cooperation of other vendors to interface with their systems, and that makes things more difficult."

6. Providing care and/or exchanging information for transitions and emergency care

The timely exchange of relevant patient information between settings continues to be extremely challenging. Clinicians in integrated delivery systems cited the ability to access a patient's record throughout the system as a facilitator of both continuity and coordination during transitions. In most other settings, however, PCPs complained of not reliably receiving hospital admission or discharge summaries before they were needed at the point of care. There was little electronic communication between inpatient and outpatient settings. Physicians admitting their own patients to the hospital or ER often used their practice's web-based EMR to overcome the lack of interoperability.

Although EMRs can help, a cultural shift among physicians may be needed to improve communication procedures and timely communication that makes data available at the point of care. For example, one PCP cited the importance of surgeons understanding that completing the operating room report in a timely way so that it is available to the PCP at the follow-up visit is part of their active patient care responsibility.

DISCUSSION

There is a gap between policy-makers' expectation of current EMRs' role in the coordination of care and clinicians' real-world experience with them. We found that commercial ambulatory care EMRs facilitate care coordination within a practice by making data available at the point of care, but they are less helpful for exchanging information between practices and settings. EMRs may also have unintended consequences for coordination, such as creating an information overload that complicates providers' efforts to discern key clinical information.

Current EMR design is heavily driven by billing and documentation needs, rather than by patient and provider needs around clinical management. Lack of payment incentives and insufficient operational processes for coordination complicate the challenges clinicians face in using current EMRs. Collaborative decision making remains difficult even in integrated systems where clinicians use the same EMR.

Box 1. EMRs and Care Coordination: Lessons Learned

▪ EMRs, as currently designed and used, are helpful to coordination of care within the practice because they make some data available in real-time when it can be used for decision making with patients; but they are less helpful to coordination between clinicians across practices

▪ Present day EMRs are designed for linear (point-in-time) documentation, whereas coordination of care is a dynamic process

▪ Managing information overflow that can result from EMRs can be challenging for care coordination (e.g., repetitive content of notes and inappropriate use of templates can hinder coordination because it is difficult to identify important clinical information)

▪ The benefits of the EMR to coordination are limited if one simply uses the EMR as a paper chart

▪ Initial and ongoing investments are required to maximize the EMRs' utility for care coordination

▪ Maximizing the potential of an EMR for coordination involves ongoing evolution of clinical care processes as well as clinician input on EMR design modifications and standards for data exchange to support those processes

▪ Research aimed at developing EMRs that better support care coordination is necessary

▪ Modifying reimbursement to encourage coordination of care by clinicians will likely drive clinicians to demand better EMR functioning to support coordination

▪ Simply creating incentives to adopt EMRs as they currently exist, given the confines of the current payment system, may result in the EMRs being designed for billing purposes primarily rather than for clinical relevance to patients and care coordination

From the perspective of ambulatory care clinicians, EMRs that better reflect the natural flow of patient care and the dynamic coordination process within and across practices are necessary. Additional research to support the development of such EMRs is needed. Box 1 highlights these and other lessons learned.

Qualitative research such as this can uncover details about respondents' experiences, identify hypotheses for further investigation and permit triangulation of provider, EMR vendor and thought leader perspectives, but our study has limitations. Given the sample size, the lack of inclusion of all specialty types, and our emphasis on small to medium-sized practices, our findings should not be generalized to all practices with EMRs. We were not comfortable drawing comparisons between smaller and larger groups' experiences given the qualitative nature of these data.

IMPLICATIONS FOR PROMOTING EMR ADOPTION AND MEDICAL HOMES

Major policy efforts such as the ARRA (HITECH Act) and Medical Home initiatives [8,20,21] aim to improve care coordination by: (1) establishing standards for data exchange across different EMR systems;[22,23] (2) promoting refinement of EMRs and clinical care processes;[20,24] and (3) altering payment incentives to foster coordination.[20] Our findings have implications for these initiatives.

HITECH

The HITECH Act aims to create a strategic plan for implementing a nationwide interoperable health information system. Some practices in our study were likely "leaders" in EMR implementation, and even they cited numerous obstacles to maximizing EMR use for coordination. Moving more typical practices toward adoption of EMRs to support coordination tasks will require extensive support to practices, clear standards for real-time data exchange across providers and better EMR tools.[25]

HITECH provides incentives for the "meaningful use" of IT by providers and use of a "qualified or certified" electronic health record to exchange data. How these terms are defined will affect the initiative's effectiveness.[26,27] Our findings suggest that in defining "meaningful use," prioritizing the exchange of medication lists, recent test and diagnostic results, and care summaries, as well as standardizing the data content, may be important.[27] New tools to assess EMR quality[28]—such as a tool to measure the timeliness with which data are reported back to the coordinating provider's EMR—could encourage vendors to improve capabilities.

In the longer term, more complex elements of coordination might be addressed through meaningful use and EMR certification requirements. Shared care plans and "service agreements" that define common expectations about how primary care and specialist physicians will exchange information and delineate care responsibilities are examples.[29,30] Secure community-based information exchanges could facilitate sharing care plans and support the initiation and ongoing communication required for successful service agreements.

Substantial training and ongoing support for medical practices will be required to reduce the need for work-arounds. Government and payers may be better positioned than individual practices to cover the cost of ongoing training, programming and changes needed to overcome existing EMR design challenges.[31,32]

Under HITECH, Health Information Technology Regional Extension Centers (Regional Centers) will offer technical assistance, guidance and information on "best practices" for using Electronic Health Records, particularly to small primary care services practices.[33] Our findings highlight the need for these centers to potentially aggregate feedback from clinicians to vendors and policymakers. They might also provide an infrastructure for shared learning with expert staff and for more experienced practices to assist newcomers.

Medical Homes

"Patient Centered Medical Homes" seek to provide patients with accessible, continuous, comprehensive and coordinated care through investments in primary care.[12,20,34] To qualify as a "medical home," a practice is expected to manage patients' care, incorporate recommendations from other clinicians, track referrals and transitions across care settings, and perform population-based tracking and quality improvement.[20,35] Study participants found EMR support for these activities to be suboptimal. For example, poor referral tracking capabilities within EMRs were a challenge.[36] In addition, if medical homes are to be accountable for coordinating care transitions, technical standards to enhance communication between EMR systems, as well as standardizing notification procedures between hospitals and outpatient providers, are critical.

New data standards and improved HIT functionalities could also decrease the difficulty primary care practices have obtaining data from other practices, laboratories and hospitals.[37] Outside providers need to be able to "push" clinical data, such as test and diagnostic reports, back to the PCP in formats that can easily populate the patient's record.

In summary, the new funding for EMR adoption[8] and the ongoing work on standards for data exchange need to be accompanied by more attention to reengineering EMRs and HIT so that they better support the coordination of care. Concurrent evolution of clinical care processes is also necessary to improve coordination and to maximize the potential of EMRs. Given current fee-for-service incentives, lack of attention to modifying both EMR design and clinical care processes may result in continued overemphasis on the use of EMRs for documentation and billing purposes rather than as a tool to improve patient care and coordination.

Corresponding Author: Ann S. O'Malley, MD, MPH; Center for Studying Health System Change, 600 Maryland Ave., S.W., Suite 550, Washington, DC 20024-2512, USA (e-mail: aomalley@hschange.org).

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