EHRs in Primary Care Practices: Benefits, Challenges, and Successful Strategies

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Objectives: To understand the current use of electronic health records (EHRs) in small primary care practices and to explore experiences and perceptions of physicians and staff toward the benefits, challenges, and successful strategies for implementation and meaningful use of advanced EHR functions.

Study Design: Qualitative case study of 6 primary care practices in Virginia.

Methods: We performed surveys and in-depth interviews with clinicians and administrative staff (N = 38) and observed interpersonal relations and use of EHR functions over a 16-month period. Practices with an established EHR were selected based on a maximum variation of quality activities, location, and ownership.

Results: Physicians and staff report increased efficiency in retrieving medical records, storing patient information, coordination of care, and office operations. Costs, lack of knowledge of EHR functions, and problems transforming office operations were barriers reported for meaningful use of EHRs. Major disruption to patient care during upgrades and difficulty utilizing performance tracking and quality functions were also reported. Facilitators for adopting and using advanced EHR functions include team-based care, adequate technical support, communication and training for employees and physicians, alternative strategies for patient care during transition, and development of new processes and work flow procedures.

Conclusions: Small practices experience difficulty with implementation and utilization of advanced EHR functions. Federal and state policies should continue to support practices by providing technical assistance and financial incentives, grants, and/or loans. Small practices should consider using regional extension center services and reaching out to colleagues and other healthcare organizations with similar EHR systems for advice and guidance.

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Adoption of health information technology (HIT) is at the forefront of the national healthcare agenda. The Health Information Technology for Economic and Clinical Health (HITECH) Act authorized $27 billion in new funding to encourage adoption and meaningful use of HIT to improve quality and care coordination, and reduce costs.[1] Large financial incentives are being provided to eligible practitioners for adopting and using a certified electronic health record (EHR) to: (1) capture health information in a coded format, (2) track clinical conditions and quality reporting, (3) support clinical decision-making and care coordination, and (4) eventually improve performance.[2]

Despite recent policy efforts and growing evidence that EHRs have the potential to increase efficiency and quality,[3-5] "fully functional" EHR system adoption by office-based providers is low.[6] Physician practices are slow to adopt EHRs for a variety of reasons including high costs, lack of understanding of benefits, implementation complications, and staffing issues.[7,8] Factors that influence physician attitudes toward EHRs include: perceived usefulness, physician involvement, alignment with physician values, organizational support, and efficiency and work flow disruptions.[9-12] The majority of research on EHR adoption has been conducted in large integrated health systems and medical groups, and has not been specific to primary care, particularly small practices.[13-15] What has been shown is that small primary care practices and those treating underserved patient populations are less likely to adopt EHRs[16] and most primary care practices with an EHR do not meet basic criteria for meaningful use.[17]

The goal of this research was to determine whether primary care practices are using advanced EHR functions, what challenges they face, and how advanced functions are successfully incorporated into the care they provide. We conducted an in-depth examination of the experiences and perceptions of physicians and staff toward the benefits, challenges, and successful strategies for advanced EHR function implementation and use.

METHODS

Study Design

We used a qualitative case study of 6 primary care practices to examine EHR use and physician and staff perceptions. A purposeful sampling approach was

used to select practices across the state of Virginia with an existing EHR. Selection was based on a maximum variation of quality-related activities, location, and ownership. All participating practices were small, with 1 to 9 physicians, and were reimbursed $2000 for data collection efforts. The study was approved by the institutional review boards at George Washington University and Virginia Commonwealth University.

Take-Away Points

An in-depth case study analysis highlights benefits, challenges, and successful strategies of using EHRs meaningfully in primary care practices.

- EHR benefits include improvements in storing and retrieval of patient information; use of higher level functions resulted in improvements to chronic disease management and preventive service delivery.
- Small practices continue to face financial and technical support challenges.
- Poorly planned integration of EHR systems can diminish staff morale and jeopardize use of advanced EHR functions.
- Successful strategies include: redesigning for team-based care and new work processes, ensuring adequate technical support, and investing in training and communication.

Data Collection

Data collection and analysis was conducted by a multidisciplinary research team to draw from different perspectives and experiences. Our team's expertise included family medicine, healthcare management, information technology, nursing, and social work. Data collection was derived from telephone interviews, on-site visits involving interviews and observation, and the National Survey of Physician Organizations.[6] We conducted 3 on-site visits at each practice over a 16-month period between 2010 and 2011. Data were collected from 38 individuals: 14 physicians, 10 nurses, 3 medical assistants, 8 managers, and 3 quality-improvement staff. Key physicians and managers were interviewed up to 5 times over the course of the study; examples of questions are listed in Table 1. Interviews during on-site visits were audiotaped and transcribed. All participating individuals provided informed consent prior to data collection.

Analysis

Qualitative data analysis involved coding transcriptions of interviews using NVivo software and identifying themes within and across cases. Two investigators reviewed and coded each transcript, which were then evaluated by an external reviewer for plausibility. Different data collection methods and various key informants at each practice allowed for a more complete picture of the practices and a more robust set of conclusions. As we reviewed data, we documented consistencies and inconsistencies between data collection methods. In a few instances we found inconsistent information, which led us to analyze data more closely within the context provided and, if needed, further question the practice staff and physicians.

RESULTS

Table 2 outlines the characteristics and EHR functions exhibited in the 6 case study practices. Our sample included small independent practices as well as practices that are fully owned and operated by large healthcare systems. All practices use EHRs to input ambulatory care progress notes, patient problem lists, medications and allergies, and laboratory results. Most practices store information collected from specialists, emergency departments, and inpatient stays. This information, however, is often collected by scanning documents rather than electronic transmission. Several practices have electronic connections with hospital EHRs and clinical

Table 1. Examples of Key Informant Interview Questions

Practice Adoption of EHR Functions
1. Do you currently have an EHR?
[If yes:]
a. How many years has the EHR been operational?
b. Please tell me how you implemented the EHR in your practice.
c. Please tell me what functions of the EHR your practice currently uses. Do all physicians in the practice use these functions? Please explain.
d. Can you explain why you don't use the _____ function?
e. Can you describe how the provision of care and office operations are different with the EHR compared with prior to EHR implementation?
Health Information Technology for Economic and Clinical Health Act (HITECH)
1. Have you heard of the HITECH Act and can you tell us what you know about the requirements to receive HITECH funding?
[If no:] Interviewer will describe Act and CMS Meaningful Use Criteria
[If yes:] 2. Are you planning to request funding? Beginning what year?
3. What activities, software/hardware, processes will you need to adopt to meet the requirements? What are your plans for initiating these changes?
4. Can you describe any difficulties you anticipate in meeting these guidelines?

CMS indicates Centers for Medicare & Medicaid Services; EHR, electronic health record; HITECH, Health Information Technology for Economic and Clinical Health Act.

Table 2. Case Study Characteristics

	Participating Practice					
	1	2	3	4	5	6
Organizational characteristic						
No. years with EHR	6	8	14	6	4	3
Use of REC services[a]					X	
Rural or semi-rural	X	X			X	
Independent	X	X		X	X	
Solo		X				
EHR function						
Problem list	X	X	X	X	X	X
Ambulatory visits	X	X	X	X	X	X
Emergency visits	X	X	X	X		X
Specialist visits	X	X	X	X	X	X
Inpatient stays	X	X	X	X		X
Connection with hospital EHR	X		X			X
Medications	X	X	X	X	X	X
Radiology findings	X	X	X	X	X	X
Medication ordering reminders and/or drug interaction data	X	X	X	X	X	X
Laboratory findings	X	X	X	X	X	X
Automatic lab data	X		X	X	X	X
Clinical guidelines			X			X
Patient registry(ies)	X				X	X
E-prescribe	X	X	X	X	X	X
Patient electronic access for scheduling appointments					X	
Patient access to EHR						X

EHR indicates electronic health record; REC, regional extension center.
[a]RECs provide technical assistance to healthcare providers for adoption and use of Health Information Technology. Only 1 practice in the study was using REC services at the time of data collection; others were considering using REC services for EHR upgrades related to meaningful use requirements.

decision support tools, such as prompts for treatment options. One practice provides patient access to limited EHR information and another allows patients to schedule appointments online. All practices intend to apply for HITECH incentive payments.

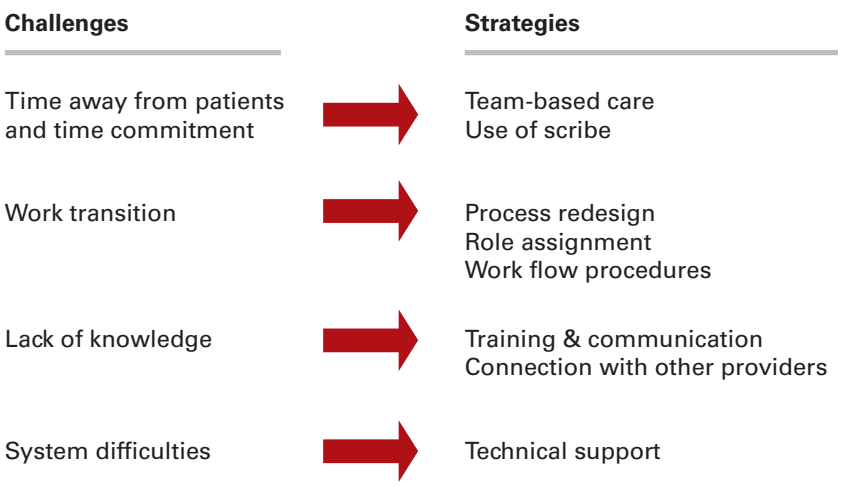
Benefits

For most of the practices, the major benefits of EHRs are increased organization, accessibility, and accuracy of patient documentation. Patient data are no longer obscured and difficult to find, with past medical history and complaints available before and during visits. Communication between physicians, staff, and patients is also a key benefit. Practices use the patient problem list, task assignment functions, and to-do lists as communication tools. One physician stated:

> *"The [EHR] is always considered a great [asset for] data collection, data clarity, data organization, data recall. But the other phenomenal asset is communication…."*

Beyond the basic functions, some practices use advanced functions toward meaningful use. Practices with patient and disease registry capabilities periodically extrapolate reports for specific patient populations and use reports to track patient care as well as for quality-improvement discussions during clinician meetings. Practices with electronic connections to EHRs with other provider organizations track patient visits to emergency departments, hospital discharge summaries, and specialist care. A physician whose EHR system is connected to a local hospital explained:

Figure. Practice Challenges and Strategies for Advanced EHR Adoption and Use



> *"We used to not care if the patient didn't come, because that was just another visit we weren't responsible for. Now, if we find out [through EHR alerts] somebody has been in the hospital, we'll call them…"*

Two practices in our study used EHRs to collect and measure quality of care data. This functionality allows them to track performance at the clinician and practice levels. Both practices are owned by large, but separate, healthcare systems which provide tremendous technical and administrative support using these functions. These practices receive health IT technical support and training from their corporate offices as well as regular quality reports on preventive care and chronic illness care. Both practices improved performance on critical measures such as mammography screening and diabetes care, as demonstrated through performance reports shared with our research team.

Challenges

Our research revealed many obstacles to practice adoption of advanced EHR functions for meaningful use. These obstacles include cost of upgraded systems, physician and staff time to learn new functions, lost productivity and disorganization during the implementation phase, complexity of EHR functions, and system issues. Considering that cost to purchase and implement EHR systems and upgrades is partially addressed by HITECH incentive payments, we focus on 4 outstanding challenges for practice adoption and use of advanced EHR functions for meaningful use incentive programs.

Time Commitment

One of the unintended consequences of EHR adoption is time away from patient care. Many physicians in our study were frustrated with the amount of time needed to enter patient data into the EHR and the clerical nature of data entry. Physicians were also aware of patient concerns regarding impersonal activities of EHR data entry during medical exams. This led to physician dissatisfaction in some practices and resistance to moving forward with advanced EHR functions required by meaningful use criteria.

Another challenge physicians and staff identified is the time needed to learn new functions and engage in new activities, such as those required for quality measurement and improvement. Practices in our study were struggling with the high workload of day-to-day patient care, which left little time for training and getting up to speed on new EHR functions. Several physicians reported spending weekends learning new EHR functions; others expressed reluctance to incorporate additional duties into their busy schedules.

Work Transition

Through observations and interviews, we learned that most practices did not proactively redesign work processes around new EHR functions. Practices reported difficulty changing work processes to support EHR functions and difficulty customizing templates and EHR features to meet practice needs. Incorporating new functions often resulted in slow implementation, disruption of patient care, and limited use or non-use of these functions. Physicians and staff reported difficulty following new work processes, lack of understanding the rationale for function use, and being unwilling or unprepared to learn new skills. An example of the difficulties of system upgrades is expressed by a nurse at one practice:

> *"The last 3 months, it's been extremely tense, extremely tense. You know we've implemented a new [major EHR upgrade] system, we've had a lot of stress…"*

Consequently, this practice experienced a high turnover rate in the 6 months following the upgrade. According to the physician owner and remaining staff members, the loss of staff was largely due to difficulties encountered in learning new EHR functions and dramatic changes to work processes.

Knowledge of EHR Functions

Other challenges reported by physicians and staff are related to knowledge of advanced EHR functions. These challenges include a high learning curve for EHR implementation and upgrades and difficulty understanding how to use EHR functions. For example, one nurse stated:

> *"The EHR may do it, but we don't understand how to use those functions."*

System Difficulties

Difficulties with EHR upgrades and systems failures are a concern, especially for practices without extensive technical support. Practices experienced occasional EHR system or server crashes, which cause major disruption to office operations and patient care. Physicians and staff also reported that some processes take more time using the EHR, the system does not adequately track patients and diseases, and the system does not meet all practice needs. Physicians and staff also repeatedly described their EHR systems as complex, too many functions to navigate, numerous steps needed to complete a transaction, and difficult to customize. Complexity of systems led to problems understanding how to utilize functions and how to incorporate these functions into day-to-day patient care and office operations.

Successful Strategies

Another goal of our study was to identify successful strategies that practices use to overcome these challenges (**Figure**).

Plan for Work Transition

Practices that experience smoother transitions in implementing advanced EHR functions plan for changes in roles and responsibilities, redesign work processes, and develop up-to-date policies and procedures. This was seen in health system–owned practices as well as in independent practices. One physician described the necessity of work flow protocols for updating medication information on patients in the EHR:

> *"Protocols for the nurses, the med reconciliations, I mean, that's huge… what a…potential liability it is if you don't have the meds right."*

Ensure Adequate Technical Support

Technical support stood out as a critical factor in basic and advanced use of the EHR. Technical support is needed for handling system failures and EHR upgrades, configuring new functions, training staff, customizing templates and other EHR features, and solving day-to-day issues. Practices that are part of larger healthcare systems have more internal access to technical support, such as a formal HIT department, than do independent practices. Independent practices use multiple methods to obtain technical support including: vendor contracts, regional extension center (REC) assistance, peer communication, and in-house expertise, such as an informal EHR "go-to person."

Operate as a Team

Practices use various team-based methods for incorporating advanced EHR functions that allow physicians to focus on patient care. One practice, part of a large healthcare system, developed a team-based care model that utilized nurses for collecting and entering most patient information into the EHR. An independent practitioner in the study hired a scribe to enter information into the EHR during and after patient-care visits. Other practices developed new roles and responsibilities for team members to enter and retrieve patient-care data from the EHR.

Invest in Training and Communication

Practices successfully using advanced EHR functions dedicated time and resources for training and communication of how to utilize new functions for patient care and improvement efforts. Multiple communication methods, such as group training, train-the-trainer, procedural "work flow" manuals, 1-on-1 guidance, and electronic resources were used to convey purpose of the new EHR function, roles and responsibilities, and instructions for system use. Several practices stressed the need for well-trained nurses and medical assistants from allied health schools for EHR activities and team-based care.

DISCUSSION

Our case studies suggest that despite incredible advances in computer technology over the past few decades, contemporary concerns about EHRs are similar to those identified earlier: inability to meet practice needs, disruption of work flow,[18] a dramatic increase in clerical tasks,[19] and inadequate return on investment.[20]

Practices that have well-established EHR systems readily acknowledge benefits, such as improvements in storage and retrieval of patient information. However, few fully benefit from the interoperability or quality-improvement features that

such systems could provide.[21-24] Limited use of HIT quality-improvement features may help explain the growing body of evidence that EHR adoption alone does not guarantee improved care.[25-30] Quality can be improved if advanced features of EHRs are consistently and effectively utilized,[31] such as physician alert and reminder systems,[32-34] and performance tracking. In our study, those that used higher level functions of EHRs demonstrated improvements in chronic disease management and preventive service delivery.

Accomplishing the goals set forth by the HITECH Act requires internal practice changes such as dedicated use of advanced EHR functions and significant modifications to work processes at the primary care practice level. Creating and sustaining highly functional teams can facilitate the move toward achieving the most benefit from these new technologies. Transition planning (ie, planning in advance for how basic processes in the office will change), including redesigning roles of individuals and work processes, responding to system interruptions, and incorporating upgrades in ways that are least disruptive, is key. Practices will also need to increase communication and training for employees and physicians, create alternative strategies for patient care during system implementation and upgrades, and formally develop new processes and procedures for provision of care and office operations. Other keys to the adoption and meaningful use of advanced EHR functions include understanding the role technology plays in primary care practice transformation for patient-centered care, how to implement and efficiently utilize the EHR, and obtaining outside financing if needed.

External technical and financial support is also critical for practices to overcome challenges in the adoption and use of advanced EHR functions. There are crucial differences in the ability of independent primary care practices to adopt and utilize EHRs for quality improvement compared with practices that are owned and operated by large healthcare systems. These practices will need additional support from outside sources. Federal and state regulators should continue to support practices by providing financial incentives, grants, and loans to practices. At the regional level, technical assistance from RECs and information-sharing between practices and other healthcare organizations are key facilitators for the adoption and use of advanced EHR functions.

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REFERENCES

1. Health Information Technology for Economic and Clinical Health (HITECH) Act, Title XIII of Division A and Title IV of Division B of the American Recovery and Reinvestment Act of 2009 (ARRA), Pub. L. No. 111-5 (Feb. 17, 2009). http://www.gpo.gov/fdsys/pkg/PLAW-111publ5/content-detail.html. Accessed May 15, 2011.

2. Centers for Medicare & Medicaid Services. CMS EHR meaningful use overview. https://www.cms.gov/EHRIncentivePrograms/30_Meaningful_Use.asp. Accessed January 7, 2011.

3. Chaudhry B, Wang J, Wu S, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. *Ann Intern Med.* 2006;144(10):742-52.

4. Furukawa MF. Electronic medical records and efficiency and productivity during office visits. *Am J Manag Care.* 2011;17(4):296-303.

5. Devine EB, Hansen RN, Wilson-Norton JL, et al. The impact of computerized provider order entry on medication errors in a multispecialty group practice. *J Am Med Inform Assoc.* 2010;17(1):78-84.

6. Rittenhouse DR, Casalino LP, Gillies RR, Shortell SM, Lau B. Measuring the medical home infrastructure in large medical groups. *Health Aff (Millwood).* 2008;27(5):1246-1258.

7. Boonstra A, Broekhuis M. Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Serv Res.* 2010;6(10):231.

8. Valdes I, Kibbe DC, Tolleson G, Kunik ME, Peterson LA. Barriers to proliferation of electronic medical records. *Inform Prim Care.* 2004;12(1):3-9.

9. Menachemi N, Burke D, Brooks R. Adoption factors associated with patient safety-related information technology. *J Healthc Qual.* 2004;26(6):39-44.

10. Gadd CS, Penrod LE. Dichotomy between physicians' and patients' attitudes regarding EMR use during outpatient encounters. *Proc AMIA Symp.* 2000:275-279.

11. Gadd CS, Penrod LE. Assessing physician attitudes regarding use of an outpatient EMR: a longitudinal, multi-practice study. *Proc AMIA Symp.* 2001:194-198.

12. Dansky KH, Gamm, LD, Vasey JJ, Barsukiewicz CK. Electronic medical records: are physicians ready? *J Healthc Manag.* 1999;44(6):440-454.

13. Chaudhry B, Wang J, Wu S, et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. *Ann Intern Med.* 2006;144(10):742-752.

14. Bryan C, Boren SA. The use and effectiveness of electronic clinical decision support tools in the ambulatory/primary care setting: a systematic review of the literature. *Inform Prim Care.* 2008;16:79-91.

15. Romano MJ, Stafford RS. Electronic health records and clinical decision support systems: impact on national ambulatory care quality. *Arch Intern Med.* 2011;171(10):897-903.

16. Hsiao C-J, Hing E, Socey TC, Cai B. Electronic Medical Record/Electronic Health Record Systems of Office-based Physicians: United States, 2009 and Preliminary 2010 State Estimates. In: Statistics NCfH, ed. Hyattsville, MD: Centers for Disease Control and Prevention; 2010.

17. Goldberg DG, Kuzel, AJ. Elements of the patient-centered medical home in family practices in Virginia. *Ann Fam Med.* 2009;7(4):301-308.

18. Friedman RB, Gustafson DH. Computers in clinical medicine, a critical review. *Computing in Biomedical Research.* 1977;10(3):199-204.

19. Schwartz WB. Medicine and the computer. *N Engl J Med.* 1970;283(23):1257-1264.

20. Rind DM, Safran C. Real and imagined barriers to an electronic medical record. *Proc Annu Symp Comput Appl Med Care.* 1993:74-78.

21. Burt CW, Hing E. Use of computerized clinical support systems in medical settings: United States, 2001-03. *Adv Data*. 2005;(353):1-8.

22. Weingart SN, Massagli M, Cyrulik A, et al. Assessing the value of electronic prescribing in ambulatory care: a focus group study. *Int J Med Inform*. 2009;78(9):571-578.

23. Isaac T, Weissman JS, Davis RB, et al. Overrides of medication alerts in ambulatory care. *Arch Intern Med*. 2009;169(3):305-311.

24. Robeznieks A. Good news and bad news.:EMR financial gains high, quality gains low: study. *Mod Healthc*. 2005;35(40):38.

25. O'Connor PJ, Crain AL, Rush WA, Sperl-Hillen JM, Gutenkauf JJ, Duncan JE. Impact of an electronic medical record on diabetes quality of care. *Ann Fam Med*. 2005;3(4):300-306.

26. Miller RH, Sim I. Physicians' use of electronic medical records: barriers and solutions. *Health Aff (Millwood).* 2004;23(2):116-126.

27. Metlay JP, Cohen A, Polsky D, Kimmel SE, Koppel R, Hennessy S. Medication safety in older adults: home-based practice patterns. *J Am Geriatr Soc*. 2005;53(6):976-982.

28. Wachter RM. Expected and unanticipated consequences of the quality and information technology revolutions. *JAMA*. 2006;295(23):2780-2783.

29. Kuehn BM. IT vulnerabilities highlighted by errors, malfunctions at veterans' medical centers. *JAMA.* 2009;301(9):919-920.

30. Crosson JC, Stroebel C, Scott JG, Stello B, Crabtree BF. Implementing an electronic medical record in a family medicine practice: communication, decision making, and conflict. *Ann Fam Med*. 2005;3(4):307-311.

31. Blumenthal D. The federal role in promoting health information technology. New York: The Commonwealth Fund Perspectives on Health Reform Brief, 2009. http://www.commonwealthfund.org/content/publications/perspectives-on-health-reform-briefs/2009/jan/the-federal-role-in-promoting-health-information-technology.aspx. Accessed August 8, 2011.

32. 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.

33. Sequist TD, Gandhi TK, Karson AS, et al. A randomized trial of electronic clinical reminders to improve quality of care for diabetes and coronary artery disease. *J Am Med Inform Assoc*. 2005;12(4):431-437.

34. Balas EA, Austin SM, Mitchell JA, Ewigman BG, Bopp KD, Brown GD. The clinical value of computerized information services: a review of 98 randomized clinical trials. *Arch Fam Med*. 1996;5(5):271-278. ■