Top 10 Lessons Learned from Electronic Medical Record Implementation in a Large Academic Medical Center

by Milisa K. Rizer, MD, MPH; Beth Kaufman, RN; Cynthia J. Sieck, PhD, MPH; Jennifer L. Hefner, PhD, MPH; and Ann Scheck McAlearney, ScD, MS

Abstract

Electronic medical record (EMR) implementation efforts face many challenges, including individual and organizational barriers and concerns about loss of productivity during the process. These issues may be particularly complex in large and diverse settings with multiple specialties providing inpatient and outpatient care. This case report provides an example of a successful EMR implementation that emphasizes the importance of flexibility and adaptability on the part of the implementation team. It also presents the top 10 lessons learned from this EMR implementation in a large midwestern academic medical center. Included are five overarching lessons related to leadership, initial approach, training, support, and optimization as well as five lessons related to the EMR system itself that are particularly important elements of a successful implementation.

Key words: Electronic medical records; implementation

Introduction

Healthcare organizations across the United States have made a significant and sustained push to implement electronic medical records (EMRs), based largely on the promise of this technology to improve the quality, productivity, and function of healthcare systems.[1, 2] Yet implementation efforts often experience only limited success.[3–5] Research has identified individual and organization-level barriers that may hinder implementation, including reluctance to change practice,[6–16] concern about new errors introduced,[17–21] and concerns about loss of productivity during initial implementation phases.[22, 23]

EMR implementation in a healthcare setting that includes a diverse mix of specialty providers and differing practice styles presents particular challenges. Specifically, variability with respect to the training needs of groups of end users, timing of implementation, and staffing arrangements present planning and logistical challenges and require flexibility in how the implementation team approaches the process.

This case study presents the experiences of implementing an EMR system across a large academic medical center serving multiple specialties in both inpatient and outpatient settings. Throughout the implementation, the chief medical information officer and her team held informal reporting sessions where participants could comment on their observations of each implementation stage and identify potential improvements for the next stage. From these sessions we distilled 10 lessons learned for EMR implementation that we present here.

Setting

The Ohio State University Wexner Medical Center (OSUWMC) is an academic medical center comprising six hospitals, two campuses, and 46 outpatient sites located on the campus of The Ohio State University. OSUWMC serves all populations and patients, with the Medicaid and underserved populations accounting for approximately 25 percent of the patient mix.

EMR implementation at OSUWMC began in 2008 with introduction of an ambulatory EMR. Subsequent implementation phases included all outpatient sites as well as a "big bang" implementation across the rest of the enterprise in 2011. The result has been a single EMR system for inpatient and ambulatory documentation and orders, registration, scheduling, and revenue cycle management. In January 2012, we initiated Meaningful Use reporting for eligible professionals (EPs), including physicians and midlevel providers who met eligibility criteria for the Meaningful Use Incentive Program.[24] For 2012 we successfully attested Stage 1 Meaningful Use for 94 percent of the 600 EPs.

Results

On the basis of our experience with EMR implementation, we identified five overarching issues that are relevant to every aspect of implementation, as well as five issues specific to this EMR system that involve new aspects of information management users needed to master for successful implementation. Below we present these 10 lessons learned.

Five Lessons about the Implementation Process

1. Ensure Leadership Support

We learned early on that **organizational leadership support and communication from the outset are keys to a successful implementation**. Leaders can be identified at all levels—system, hospital, department, division, and unit as well as from a medical school that may be associated with the institution—and also include those in the areas of compliance, legal, privacy, security, and patient safety. It is important for organizational leaders to send the message from the very beginning of the implementation that everyone will be involved, everyone will use the EMR, and there will be no option not to participate.

Leadership must be kept informed about EMR implementation progress to capitalize on opportunities to support and encourage others. The OSUWMC implemented a "scorecard" feedback system (see Figure 1). This scorecard approach enabled leaders to easily identify areas of lagging compliance so that issues could be promptly addressed.

Another opportunity for leadership is for local leaders within specific user groups to encourage their peers and model effective EMR use. In our case, within each practice location we recruited a physician champion who was well trained to use the application and could encourage his or her peers to accept the EMR and its implementation in that area as well as facilitate specialty-specific decisions.

2. Select the Appropriate Approach to Implementation for the Organization

The initial approach to implementation must balance the needs and perspectives of different types of end users. In finding that balance, consider with whom, where, which components of, and when the EMR will be implemented. The two main implementation approaches are a gradual rollout, in which locations or elements of the EMR are presented over time, and a big bang approach, in which all locations in the organization begin using all the functionalities of the EMR at the same time. Each approach has advantages and disadvantages, and these depend on one's perspective. From a hardware perspective, it may be easier to install everything in one physical location at a time. However, from a user perspective, a physician typically wants to have the same workflow at each site where he or she practices. From a patient perspective, a patient would like to have only one record that will be shared across all locations and providers.

In our case, we viewed physician acceptance as a top priority. With that focus, we met with users to understand their needs, and selected an approach based on these discussions. We eventually settled on a specialty-focused rollout with each specialty being implemented across all sites at one time. This approach allowed us to develop the workflow and documentation tools to meet the needs of all locations, and our planning process included representatives from all relevant sites for each specialty. Interestingly, this approach was also helpful for the medical record department because they had a set date when all documentation and orders were going to transition from paper to electronic format.

3. Focus on Training

Training is critical to successful EMR use, and can be provided at different times during the implementation process, as well as at different levels. We tested different approaches to the timing of training, ranging from training that occurred the day before or the day of go-live, to providing training up to two months ahead of time. We found that training earlier in the implementation process provided time for users to learn about the system, practice using relevant components, and create plans for how they would function at go-live. Nonetheless, it is important not to train too early—both to keep material fresh in users' minds at go-live, and to maintain a sense of urgency and impending activity. We also found that training similar users together, tailoring content to a particular role, was most effective. Users are more attentive in class if the training is role based and specific to their specialty.

The use of electronic learning tools that permit users to learn outside a formal classroom setting allows physician users to practice with the system and not have to sacrifice their patient care time prior to go-live. EMR implementation planners as well as users expect that productivity will decrease during the go-live period and for a few weeks after. However, preimplementation work can help to shorten that time. We encouraged users to practice using the EMR with a few real patient scenarios to provide greater context in which they could learn how they would be able to use the EMR after go-live. In our experience, the more that users took advantage of electronic learning tools and the more they practiced, the shorter time they required to resume their pre-EMR patient schedules.

4. Provide Support at Go-Live and for Optimization

Training can provide good preparation for EMR use, but it is during the go-live period that users actually begin to interact with the EMR in their daily work environment. **At go-live, well-planned support is critical.** Considerations for this type of support include determining the appropriate ratio of support personnel per user, determining the length of time intense support will be needed, and deciding the manner in which support will be provided. In our experience, we found that a ratio of 1:1 support for providers and 1:3 support for staff worked well. With sufficient support at go-live, the length of time needed to provide support can often be limited to 4–6 weeks, depending on how frequently the user interacts with the EMR.

The manner of support is also an important consideration. Initially, support should be active, intense, and "at the elbow" to allow the user to maximize the use of the native tools in the application, ensure appropriate incorporation into the workflow, and explore options during patient care that can enhance system use. As users gain more comfort, support should be tapered gradually to lessen users' feelings of being "deserted" after implementation. This process allows the user to transition to calling the help desk rather than always expecting in-person support.

Optimization is the continuing effort to help users maximize their proficiency in the use of the EMR system. The optimization process may result in the need to make some changes in the system, but the overall focus is usually on helping to improve the users' knowledge, maximize their use of the application, and streamline their workflows. In most organizations, the initial implementation process may be overwhelming—despite significant training and prework. Establishing and communicating a plan that enables trainers and support personnel to return regularly to help users optimize their EMR use may make the initial implementation process less daunting. We found that returning to the clinics at intervals of every 2–3 months during the first year and every 6 months the following year worked well.

5. Flexibility

The transition from paper to electronic records requires significant planning, training, and support, and, at least as importantly, flexibility to learn from the implementation process. In our case, the process of developing admission orders presented an early example of the importance of flexibility. This complex workflow includes physicians, residents, and midlevel providers, as well as the utilization review, compliance, and billing departments, and bed placement. Our initial workflow for admission orders was established prior to go-live through a series of meetings and discussions, and received initial support from all groups that would play a part in the process. However, once the EMR was in place, competing needs and requirements that had not been initially evident came to light as users started interacting with the system. Our compliance office made the determination that only a physician could enter the order. Physicians needed access to an order that was both succinct and actionable. The billing department wanted the order to be entered as soon as possible in the care process. Finally, the utilization review group wanted additional clarification about orders as well as the ability to change orders as needed.

We took several steps to resolve these competing issues. First, we worked with each group individually to determine and prioritize their exact requirements. Then, we established a "guiding coalition," a group of people with appropriate skill sets who could direct the change process. Once the coalition had developed a workflow plan that incorporated all the competing demands, we met with all the interested parties as a group to validate our new plan. With consensus achieved, we began promoting the plan in multiple forums—individually, one on one, in groups, at faculty meetings, in broad e-mails, and at medical staff meetings. This inclusive and flexible process resulted in adoption of the change at all levels.

Five Lessons about EMR Components Contributing to Successful Implementation

In addition to the overall issues of leadership, support, training, optimization, and flexibility, we identified several components of the EMR that were particularly important to accommodate in order to achieve implementation success. Each component represents a new aspect of information not present in paper charts and therefore required specific attention and training.

6. Secure Communication

Secure communication refers to messages, test and lab results, and communications with other providers that, with the implementation of an EMR, arrive nonstop electronically and can be viewed at any time. In the world of paper charts, these items would have arrived as faxes, letters, or phone messages, and processes had been in place to manage them. Although the introduction of electronic forms of these elements brings convenience, it also represents a new manner of processing information, and physicians must learn the best way to manage that process. In our experience, it was difficult to prepare users ahead of time because most only truly grasped the importance of this difference once they started receiving electronic results, messages, and communication from other providers. We found that physicians typically utilized time outside clinic hours, such as during the early morning or late evening hours, to manage these secure communications. As a result, we had to expand our support efforts so that we were available when physicians were using this new EMR component.

7. Referral Correspondence

The referral correspondence component of the EMR helps to manage communication outside the organization. This component is particularly relevant for specialists given their need to communicate with referring providers. A key functionality in the system that can facilitate referrals is the letter component. It is important for users to understand this function and employ it properly. The letter function is used to convey an accurate story of the patient's visit as well as recommendations for ongoing care, thus making it a critical area for training so that providers can incorporate this function into their daily practice workflows.

8. Documentation Tools

Documentation tools are very important and provide a significant reason for organizations to migrate to an EMR. These tools include the use of templates, prepopulated text, imports of discrete data from another location within the EMR into progress notes, or the use of "copy and paste" or "copy forward" functions from previous notes. Many EMRs have native documentation tools that allow this functionality. We found that users needed support and reinforcement to learn to use these tools properly. Emphasis should be put on the continuity of documentation as well as the accuracy of content to prevent inappropriate use of the copying features within an EMR. We found that the assignment of a subject matter expert in each specialty area provided a single point of contact for the system builders as well as for the users in that specialty area. Once users understand the system, it becomes easier to transition to them building their own documentation tools based on the initial design. The use of these tools can be reinforced in training as well as at go-live.

9. EMR Vendor Model System

The ability to tailor a system to meet the individual needs of an institution or a user was at one time a desirable aspect of an EMR system. Since the advent of Meaningful Use and the use of an EMR to meet the required measures, the need for standardization in workflow has become more important. Many EMR vendors are developing standard structures and builds for their applications based on what has worked for their existing users. This standardization can allow for easier implementation and more efficient scheduled upgrades of the software. However, it does limit customization of the software for a specific institution or specialty. With the rapid development of EMR functionality, institutions can benefit by implementing the standard or model build and save builders time in the design and validation phases of the implementation of the application, both of which can be significant, as well as during the ongoing system improvements that incorporate changes required by government regulations.

10. Patient Portals

The patient portal for the EMR is a means for patients to access much of the medical information stored in the EMR and to communicate with their providers. This feature has been gaining in popularity and is a focus of Stage 2 Meaningful Use standards. Through patient portals, patients are able to schedule appointments, view lab and test results, and ask their providers questions, each of which is a feature newly in electronic form that requires appropriate training and decisions about process changes. Because the EMR system we implemented does not allow automatic filling of responses to these items, we found that implementing patient portals as soon after go-live as possible made it easier to incorporate this new function into user workflows. While many providers had concerns that the patient portal would result in them receiving messages at all hours of the day, with proper planning and consistent attention to the in-basket function of the EMR, the patient portal can actually increase efficiency for both the office staff and physicians, as well as increase patient satisfaction.

Discussion

This case study presents our experiences implementing an EMR in a large and diverse health system. We identified leadership, planning, and flexibility as important elements of a successful implementation. Leadership provides necessary motivation and support at all stages of implementation. Buy-in from leaders early in the process is critical. Within smaller groups, leaders can serve as champions to model successful EMR use and encourage their peers in the process. Planning in the areas of how to approach the rollout as well as how and when to train users can also ease the transition and allow providers to return to a normal practice schedule more quickly. Users then benefit from the knowledge that opportunities will be available to optimize their use of the EMR once they have had some time to work with the system itself. Further, a process as complex as EMR implementation requires considerable flexibility and learning not only on the part of end users but also on the part of the information technology team, and our experience with implementing the admission order process provides an example of this flexibility.

Also important are key components of the EMR that represent new ways of using information—secure messaging, in-baskets, referral correspondence, documentation tools, and patient portals. These components can add to the efficiency of electronic records but will require new skill sets to ensure appropriate use. The implementation team should be aware of these factors and be able to adapt their training and support functions in order to foster new learning over time.

Limitations

As a large academic medical center, OSUWMC has at its disposal considerable resources—both human and financial. The lessons we learned may also apply to smaller hospitals and health systems, but we recognize that such organizations may face additional challenges that could impact and further complicate EMR implementation.

Conclusion

EMRs offer tremendous potential to improve quality, productivity, and outcomes in patient care, but they also represent one of the most significant changes healthcare organizations may undertake. A well-planned implementation with leadership support and an organized effort involving employing physician champions, efficient training, and optimization, as well as flexibility on the part of the implementation team, will make the process more smooth and can reduce the impact of EMR implementation on productivity. Particular attention in training and support to specific components of the EMR system that are new or require new workflows, such as patient portals and documentation tools, will aid users and contribute to a more efficient learning process.

Milisa K. Rizer, MD, MPH, is chief medical information officer, associate professor of clinical family medicine, and associate professor of biomedical informatics at The Ohio State University in Columbus, OH.

Beth Kaufman, RN, is the assistant director of health systems informatics at The Ohio State University Wexner Medical Center in Columbus, OH.

Cynthia J. Sieck, PhD, MPH, is an assistant professor in the Department of Family Medicine at The Ohio State University in Columbus, OH.

Jennifer L. Hefner, PhD, MPH, is a postdoctoral researcher in the Department of Family Medicine at The Ohio State University in Columbus, OH.

Ann Scheck McAlearney, ScD, MS, is a professor of family medicine and vice chair for research in the Department of Family Medicine at The Ohio State University in Columbus, OH.

Notes

1. Kokkonen, Erik W., Scott A. Davis, Hsien-Chang Lin, Tushar S. Dabade, Steven R. Feldman, and Alan B. Fleischer Jr. "Use of Electronic Medical Records Differs by Specialty and Office Settings." *Journal of the American Medical Informatics Association* 20 (2013): e33–e38.
2. Hillestad, R., J. Bigelow, A. Bower, F. Girosi, R. Meili, R. Scoville, and R. Taylor. "Can Electronic Medical Record Systems Transform Health Care? Potential Health Benefits, Savings, and Costs." *Health Affairs* 24, no. 5 (2005): 1103–17.
3. Lapointe, Liette, and Suzanne Rivard. "A Multilevel Model of Resistance to Information Technology Implementation." *MIS Quarterly* 29, no. 3 (2005): 461–91.
4. Blumenthal, David, and Marilyn Tavenner. "The 'Meaningful Use' Regulation for Electronic Health Records." *New England Journal of Medicine* 363, no. 6 (2010): 501–4.
5. Kaplan, Bonnie, and Kimberly D. Harris-Salamone. "Health IT Success and Failure: Recommendations from Literature and an AMIA Workshop." *Journal of the American Medical Informatics Association* 16, no. 3 (2009): 291–99.
6. Miller, Robert H., and Ida Sim. "Physicians' Use of Electronic Medical Records: Barriers and Solutions." *Health Affairs* 23, no. 2 (2004): 116–26.
7. Poon, Eric G., David Blumenthal, Tonushree Jaggi, Melissa M. Honour, David W. Bates, and Rainu Kaushal. "Overcoming Barriers to Adopting and Implementing Computerized Physician Order Entry Systems in US Hospitals." *Health Affairs* 23, no. 4 (2004): 184–90.
8. Berg, Marc. "Implementing Information Systems in Health Care Organizations: Myths and Challenges." *International Journal of Medical Informatics* 64, no. 2 (2001): 143–56.
9. Ash, Joan S., and David W. Bates. "Factors and Forces Affecting EHR System Adoption: Report of a 2004 ACMI Discussion." *Journal of the American Medical Informatics Association* 12, no. 1 (2005): 8–12.
10. Makoul, Gregory, Raymond H. Curry, and Paul C. Tang. "The Use of Electronic Medical Records Communication Patterns in Outpatient Encounters." *Journal of the American Medical Informatics Association* 8, no. 6 (2001): 610–15.
11. McAlearney, Ann Scheck, Sharon B. Schweikhart, and Mitchell A. Medow. "Doctors' Experience with Handheld Computers in Clinical Practice: Qualitative Study." *BMJ* 328, no. 7449 (2004): 1162.
12. Gans, David, John Kralewski, Terry Hammons, and Bryan Dowd. "Medical Groups' Adoption of Electronic Health Records and Information Systems." *Health Affairs* 24, no. 5 (2005): 1323–33.
13. Kaplan, Bonnie, and Kimberly D. Harris-Salamone. "Health IT Success and Failure: Recommendations from Literature and an AMIA Workshop."
14. McGinn, Carrie A., Sonya Grenier, Julie Duplantie, Nicola Shaw, Claude Sicotte, Luc Mathieu, Yvan Leduc, France Légaré, and Marie-Pierre Gagnon. "Comparison of User Groups' Perspectives of Barriers and Facilitators to Implementing Electronic Health Records: A Systematic Review." *BMC Medicine* 9 (2011): 46.
15. Saathoff, A. "Human Factors Considerations Relevant to CPOE Implementations." *Journal of Healthcare Information Management* 19, no. 3 (2005): 71–78.
16. McAlearney, Ann Scheck, Jennifer L. Hefner, Cynthia Sieck, Milisa Rizer, and Timothy R. Huerta. **"**Implementing an Ambulatory Care Electronic Health Record: Fundamental Changes for Physicians and Implications for Their Clinical Practice." *Journal of the American Board of Family Medicine* 28, no. 1 (2015): 55–64.
17. DesRoches, Catherine M., Eric G. Campbell, Sowmya R. Rao, Karen Donelan, Timothy G. Ferris, Ashish Jha, Rainu Kaushal, Douglas E. Levy, Sara Rosenbaum, and Alexandra E.

Shields. “Electronic Health Records in Ambulatory Care—a National Survey of Physicians.” *New England Journal of Medicine* 359, no. 1 (2008): 50–60.
18. Burt, Catharine W., and Jane E. Sisk. “Which Physicians and Practices Are Using Electronic Medical Records?” *Health Affairs* 24, no. 5 (2005): 1334–43.
19. Lorenzi, Nancy M., Angelina Kouroubali, Don E. Detmer, and Meryl Bloomrosen. “How to Successfully Select and Implement Electronic Health Records (EHR) in Small Ambulatory Practice Settings.” *BMC Medical Informatics and Decision Making* 9 (2009): 15.
20. Boonstra, Albert, and Manda Broekhuis. “Barriers to the Acceptance of Electronic Medical Records by Physicians from Systematic Review to Taxonomy and Interventions.” *BMC Health Services Research* 10, no. 1 (2010): 231.
21. McGinn, Carrie A., Sonya Grenier, Julie Duplantie, Nicola Shaw, Claude Sicotte, Luc Mathieu, Yvan Leduc, France Légaré, and Marie-Pierre Gagnon. “Comparison of User Groups’ Perspectives of Barriers and Facilitators to Implementing Electronic Health Records: A Systematic Review.”
22. Boonstra, Albert, and Manda Broekhuis. “Barriers to the Acceptance of Electronic Medical Records by Physicians from Systematic Review to Taxonomy and Interventions.”
23. Menachemi, Nir. “Barriers to Ambulatory EHR: Who Are ‘Imminent Adopters’ and How Do They Differ from Other Physicians?” *Informatics in Primary Care* 14, no. 2 (2006): 101–8.
24. Centers for Medicare and Medicaid Services. “EHR Incentive Programs—Data and Reports.” https://www.cms.gov/EHRIncentivePrograms/56_DataAndReports.asp (accessed March 20, 2012).

Figure 1

Sample Scorecard

		Pre-Live Metrics											Go-Live Metrics							Post-Live Metrics				
		Schedule Reduction Complete						Content Analysis/ Design Participation					Adhered to Schedule Reduction							Close Encounter				
Physician / Nurse Practicioner	Specialty	Go Live Week 50%	Go Live +1 Week 30%	Go Live +2 Weeks 20%	Go Live +3 Weeks 10%	Abstract 20 Charts	Complete eLearning Modules	Content Analysis	Content Design	Content Testing	Attended End-User Training	Dictation Utilization	Redcoat Utilization	Go Live Week	Go Live +1 Week	Go Live +2 Weeks	Go Live +3 Weeks	Dictation Utilization	Close Encounter	Dictation Utilization	<24h	24-72h	>72h	N
Dr. A	HEART FALURE	63%	69%	88%	44%	not started	0/14				Y	Y		58%	69%	81%	38%		8		0.0%	40.0%	60.0%	45
Dr. B	CARDIOLOGY	31%	75%	75%	50%	not started	0/14				Y	Y		25%	56%	81%	44%		4		100.0%	0.0%	0.0%	36
Dr. C	HEART FALURE	75%	83%	83%	83%	not started	0/14				Y	Y		42%	58%	83%	92%		2/5		31.0%	69.0%	0.0%	29
Dr. D	CARDIOLOGY-INTERVENTIONAL	59%	47%	88%	82%	3	0/14				Y	Y		82%	47%	94%	71%		12		93.1%	6.9%	0.0%	58
Dr. E	CARDIOLOGY	77%	103%	97%	73%	not started	0/14				Y	Y		73%	100%	97%	90%	1**	2/6		43.8%	49.1%	7.9%	114
Dr. F	CARDIOLOGY-INTERVENTIONAL	75%	69%	69%	63%	not started	0/14				Y	Y		50%	69%	113%	113%		3		10.3%	0.0%	89.7%	29
Dr. G	CARDIOLOGY	140%	60%	100%	160%	not started	0/14				Y	Y		140%	60%	60%	60%				96.0%	4.0%	0.0%	25
Dr.H	CARDIO-THORACIC SURGERY	100%	0%	71%	43%	not started	0/14				Y	Y		100%	71%	114%	100%			7*	100.0%	0.0%	0.0%	9
Dr. I	CARDIOLOGY	167%	67%	107%	80%	not started	0/14				Y	Y		160%	40%	80%	67%		1/1		24.2%	27.3%	48.5%	33
Dr. J	CARDIOLOGY	92%	0%	46%	62%	not started	0/14				Y	Y		92%	15%	46%	77%	2*	1	21*	100.0%	0.0%	0.0%	25
Dr. K	HEART FALURE	100%	62%	54%	46%	not started	0/14				N	Y		92%	62%	54%	62%				2.4%	7.3%	90.2%	41
Dr. L	CARDIO-THORACIC SURGERY	50%	25%	0%	75%	not started	0/14				N	Y		50%	25%	25%	75%			12*	100.0%	0.0%	0.0%	14