Electronic Health Records (EHR) Implementation and Post Implementation Challenges

Muhammad A. Razi
muhammad.razi@wmich.edu
269-387-5524
Christopher Emmert
christopher.b.emmert@wmich.edu
Dan Austin
daniel.austin@wmich.edu
J Michael Tarn
mike.tarn@wmich.edu
269-387-5409
Khandaker N. Islam
khandaker.n.islam@wmich.edu

Department of Business Information Systems
Haworth College of Business
Western Michigan University
Kalamazoo, MI 49008-5412, USA

Abstract: The US Healthcare Industry lags behind other industries in its use of technologies for process improvement and improvement in quality of services for its patients. Globally, United States is significantly behind some European and Australian countries in implementation of EHR. While the federal government is now mandating this change and also offering incentive programs, healthcare providers remain slow to comply because of challenges they face regarding EHR implementation. This paper discusses EHR architecture, presents implementation challenges, provides a case study and offers future research ideas. The information provided in this research could be beneficial for successful EHR implementation.

INTRODUCTION

The US Healthcare Industry generally lags behind other industries in its use of technologies for process improvement and improvement in quality of services for its patients. Globally, United States is significantly behind some European and Australian countries in implementation of EHR. Even in 2004-2005, more than half of healthcare providers in Sweden, the United Kingdom, the Netherlands, and Australia were using EHR (Ash & Bates, 2005; Podichetty & Penn, 2004). Studies have shown that along with the improvement in quality, efficiency, and effectiveness, many medication errors, which are the most common cause of preventable injuries in hospitals, can be prevented by such EHR systems (Torda, Han, Scholle, 2010; Poon, E. G., Blumenthal, D., Jaggi, T., Honour, M. M., Bates, D. W., & Kaushal, R. 2004). While the federal government is now mandating that providers transform from paper to electronic health records (EHR), several studies point to the fact that healthcare providers remain slow to comply because of many challenges they face (Stikeman, 2001; Coile, 2002; Bates, 2003; Bakhtiari, 2010). EHR is a complex endeavor. While Electronic Medical Record (EMR) represent record of health-related information on an individual by a single organization (Figure 1), EHR is a highly complex multi-organizational collaborative process of health-related information of an individual (Figure 2). The complexity of EHR varies depending on architectural style, for example, a platform-based EHR tend to be more homogeneous and simpler compared to a provider-based or a patient-based EHR.
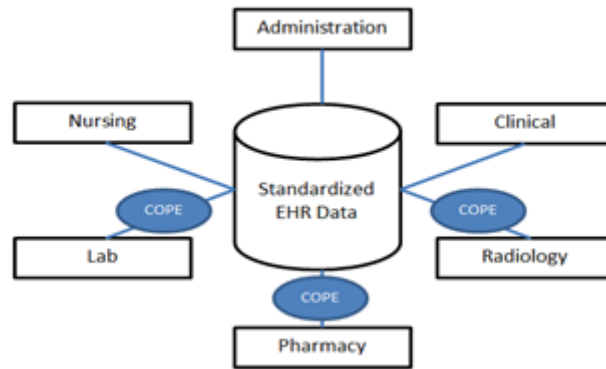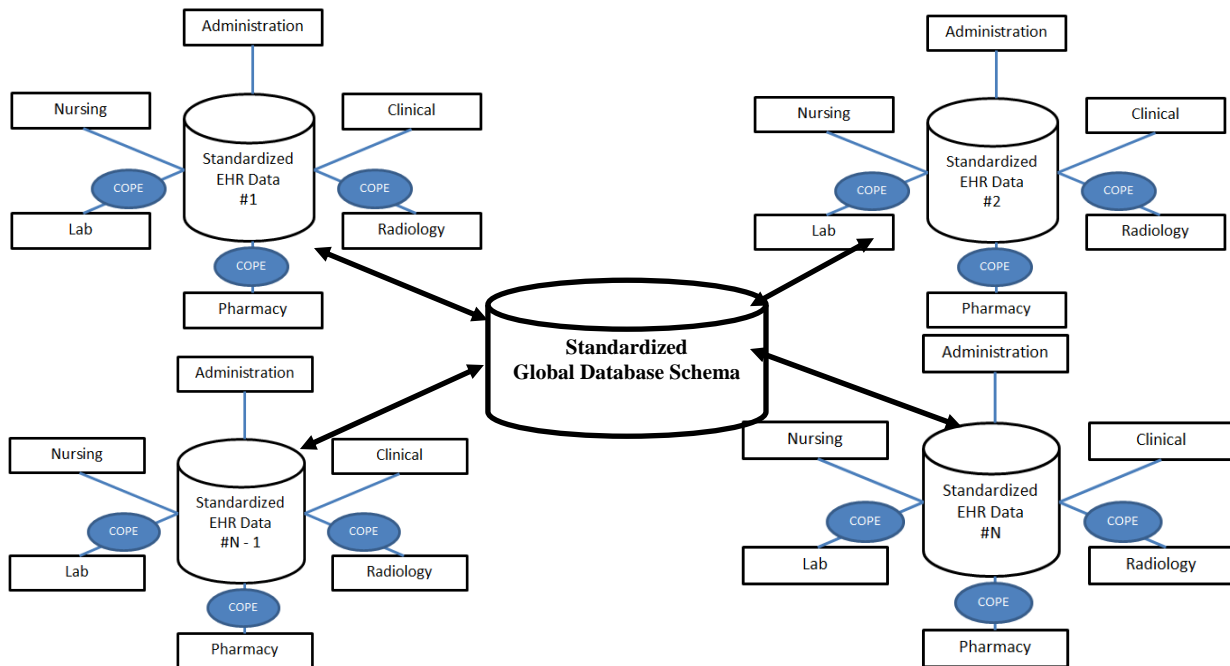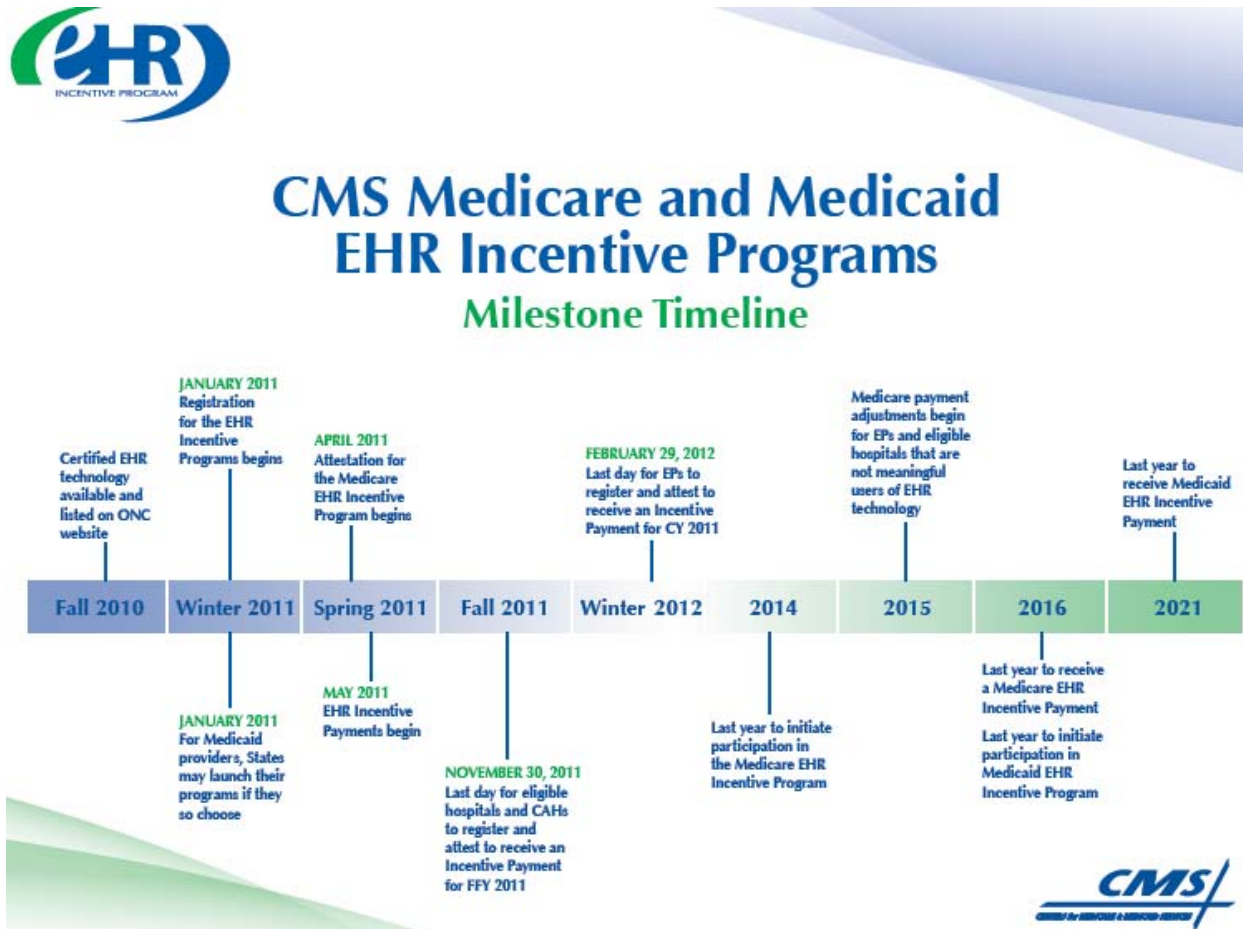
Figure1: EHR Concept – Single Provider

Figure 2: EHR Concept – Multiple Providers

As with any complex integrated system, some components are standard and others vary by facility. Following is a list of standard EHR components.

1. Administrative component: Patient, admissions, discharges, and transfer information (National Committee for Vital Health Statistics, 2002)
2. Laboratory component: Orders of tests, results, and billing information.
3. Radiology component: Orders of images, results, and billing information. Lorenzetti (2003) mentioned that about 80% of institutions had this capability in 2001.
4. Pharmacy: Automated entry of prescription drugs is highly desirable and would eliminate manual entry error (Ondo and Hess, 2005).
5. Computerized physician order entry (CPOE): CPOE allows integration of 2, 3, and 4 components. CPOE is a must and should also be compatible with other EHR components.

6. Document Repository: EHR must allow providers to capture notes, assessments, and generate reports whenever needed.
7. Compliance Checker: This component consists of E-Consent system and Compliance system. This component could possibly be done by a third party checker for simplicity and cost effectiveness.

US government is also offering Medicare and Medicaid EHR Incentive Programs for EHR adopters (Figure 3). Medicare and Medicaid EHR Incentive Programs provide 'incentive payments to eligible professionals, eligible hospitals and critical access hospitals (CAHs) as they adopt, implement, upgrade or demonstrate meaningful use of certified EHR technology' (http://www.cms.gov/ehrincentiveprograms/).

Source: http://www.cms.gov/EHRIncentivePrograms/Downloads/EHRIncentProgtimeline508V1.pdf

Figure 3: Medicare and Medicaid EHR Incentive Programs

The purpose of this study is to identify EMR/EHR components, prepare a list of EHR implementation and post implementation challenges and present a case study. In the previous section, we have already provided simple schematic diagrams of EMR and EHR. In the next couple of sections we present our findings on EHR implementation and post implementation challenges followed by a case study. Conclusion and future research directions are provided last.

EHR: IMPLEMENTATION CHALLENGES

Jha, DesRoches, Kralovec, & Joshi (2010) in a recent survey of U.S. hospitals, found that the share of hospitals adopted either basic or comprehensive EHR has risen modestly, from 8.7 percent in 2008 to 11.9 percent in 2009. Small, public, and rural hospitals were less likely to embrace electronic records than their larger, private, and urban counterparts. Only 2 percent of U.S. hospitals reported having electronic health records that would allow them to meet the federal government's "meaningful use" criteria. Another study reported that only 20% of practicing physicians and 9% of all healthcare facilities have begun and/or completed the transition to EHRs (Lohr, 2008). These findings underscore the fact that the transition to a digital health care system is complex, challenging, and likely to be a long one. There exist many EHR adoption/implementation challenges. A few of the EHR implementation challenges are listed below:

1. Lack of an appropriate policy towards EHR adoption
2. Lack of technical expertise, Isolation of data, Lack of knowledge about best practices
3. Unrealistic expectations on implementation scope, time, funding, implementation disruptions etc.
4. Lack of understanding of the benefits of EHR, and how to extract maximum benefit from the system.
5. Developing a sustainable business model
6. Adoption of e-consent and adoption of CPOE
7. Resistance to process re-engineering. Practice redesign and quality improvement methods are integral to successful use of the full capabilities of EHR. (Torda, Han, Scholle, 2010).
8. Bad experience with a previous implementation
9. Security, communication, training requirements, etc.
10. Availability of expert help during implementation and post-implementation stability phase
11. Availability of experts in legal, financing, and regulatory issues
12. Revenue may decline during implementation process

EHR: POST IMPLEMENTATION CHALLENGES

Process change: Old habit die hard

As with all new implementations, the most obvious change is workflow related change, and EHR is no exception. Everyone including administrators, physicians, nurses, and ancillary staff need to start capturing, retrieving, and sending information electronically instead of paper based storage, retrieval, and communication. Appropriate training at all levels before going live with EHR is critical. The success of any implementation depends on how quickly end users are able to use the system efficiently and effectively.

Technology change

EHR is totally dependent on complex and compatible working components of many hardware and software. Therefore, making sure that all of these components work properly is critical. A team of experts internal or outsourced need to be available 24/7 at least for several months to a year.

Policies and Procedures

Management need to implement standard process control for creation, modification, update, and implementation of policies and procedures. Since IT is in the core of EHR, management responsible for policies and procedures need to keep the IT department in the loop. It is standard IT practice to have a change control policy to ensure that changes are approved and properly tested before being added to the production environment.

CASE STUDY: ANONYMOUS MEDICAL CENTER (ANMC) IN THE MIDWEST

Anonymous Medical Center has been using EHRs for over 15 years. Their first implementation was a product called ProTouch made by a Trilogy, a small software company. It was UNIX based and, while very basic, met

ANMC's needs for many years. Each client computer had a small installation of the program that communicated with a number of servers. ANMC had three or four employees on-site and ProTouch was maintained by four employees at the company that provides the software for several clients. It became apparent that the needs of the user group - mainly nurses and people entering physician orders (business associates, health unit coordinators or ward secretaries as they are sometimes referred) - were quickly outpacing the system's capabilities. So, in 2004 ANMC and its parent company partnered with Cerner Corporation for the implementation of their next generation EHR.

For a number of years ANMC only had its intensive care units (ICUs) using Cerner. Senior leadership determined that the Cerner system was too costly to have just four ICUs (five at the time the decision was made) using Cerner and developed a plan to roll the EHR out to the rest of the hospital campus and to the physician practices affiliated with ANMC and their two smaller hospitals. In addition, ANMC's parent company piloted a new initiative and share resources with another member of the parent company's family in New York. To date they are the only such implementation and it has proved to be a challenge given that the two health systems have different state regulations, but must agree on the content of their EHR.

The strategy for rolling Cerner out to the rest of the health system involved intensive planning sessions between IT and stakeholders in different clinical areas around the hospital coupled with a series of staggered and phased go-lives with 24x7 support. Some units went live with orders and documentation, while others went live only with the ability to view documentation until the legacy EHR was phased out. This approach, while cumbersome, allowed for analysts to support go-lives while simultaneously giving IT more time to address the go-live needs of areas with special needs or more complex clinical workflows. Other larger sister hospitals with a greater IT presence opted for a "big bang" strategy where multiple sites/facilities went live with full functionality concurrently.

ANMC decided to have Cerner remotely host the database servers and application servers at their data center in the Midwest rather than have those servers on-site and use their own staff for server maintenance. One of the downsides of having a remote hosted mission critical application is that if the wide area network (WAN) goes down for any reason then the whole system becomes unusable until connectivity is restored. This downside is overcome at ANMC by having several "fat client" installations on-site that download patient data every 15 minutes just in case connectivity is disrupted for an extended period of time. Each unit has several of these PCs that function as regular workstations during normal operation, but would also serve as a critical component in the downtime plan.

LESSONS LEARNED

1. Modest achievable goals
2. One or more trusted implementation partners
3. Comprehensive implementation strategy sessions
4. Phased go-lives with 24x7 support
5. Robust backup plan

CONCLUSION

In spite of the extraordinary size of the Healthcare Industry in the United States today, its implementation of information technology is surprisingly low. This is best represented by the extremely low percentage of physicians currently using Electronic Health Records. However, this practice will soon change as the federal government established the goal of creating an EHR for every US citizen by 2014. To aid in this process, the American Recovery and Reinvestment Act was created in 2009.

While many providers are cognizant of these government mandates, they are slow to transition from paper to electronic records for many reasons. Some do not see the benefit of EHRs. Others do not understand the database, hardware, and/or software needed to run such a system. Many providers are unaware of the incentives being offered for compliance. Finally, those who are able fear the post implementation problems and worry about the system hindering their processes and the care they provide their patients. We have, in this paper, discussed EMR/EHR

schema and identified quite a few implementation challenges. A case also has been presented to provide a real-world scenario of EHR implementation.

Change is never easy for individuals or organizations and it is only natural for healthcare providers to resist drastically changing their established process for maintaining patient records. However, by understanding the concerns of the workers, their objections can be overcome. In addition, educating doctors, nurses, and other front line healthcare workers in the benefits of Electronic Health Records will provide justification for the temporary discomfort they experience while transitioning. Currently, the diagnosis of the Healthcare Industry is that it is too slow in its implementation of information technology. However, healthcare providers can use the information provided in this research for EHR implementation success.

FUTURE RESEARCH DIRECTION

Several authors have mentioned one or more of the challenges mentioned in previous sections (Torda, Han, Scholle, 2010; Kulkarni, 2006; Miller, West, 2007; Valerius, 2007; Weber, 2005; Gupta, Murtaza, 2009; DeVore, Figlioli, 2010), however, a comprehensive study on understanding multi-dimensional challenges emanating from complex EHR implementation does not exist. Patten (2005) studied implementation of CPOE and concluded that along with some success with CPOE implementation, there had been many failures, and that had led to skepticism and slow progress. Terry's (2010) focus was on technical knowledge and lack of technical knowledge as the major reason for slow EHR implementation. Therefore, there is a great opportunity for identification and documentation of major multi-dimensional EHR implementation challenges. That can be achieved by conducting a comprehensive survey of hospitals and healthcare providers. Afterwards, a model for successful implementation of EHR can also be developed.

REFERENCES

Ash, J. S., & Bates, D. W. (2005), "Factors and Forces Affecting EHR System Adoption: Report of a 2004 ACMI Discussion". *J Am Med Inform Assoc*, 12, 8-12.

Bakhtiari, E. (2010), "Physicians Making Progress on EHR Adoption", HealthLeaders Media, January 14, 2010. http://www.healthleadersmedia.com/content/PHY-244942/Physicians-Making-Progress-on-EHR-Adoption

Bates, D.W. (2003), "A Proposal for Electronic Medical Records in US Primary Care," *Journal of American Medical Informatics Association*, vol. 10, no. 1, pp. 1-10.

Coile, R.C.J. (2000), "E-Health: Reinventing Healthcare in the Information Age," *Journal of Healthcare Management*, vol. 45, no. 3, pp. 206-210.

DeVore, S. D. & Figlioli, K. (2010), "Lessons Premier Hospitals Learned About Implementing Electronic Health Records", *Health Affairs*, 29(4), pg. 664

Gupta, V. and Murtaza, M. B. (2009), "Approaches To Electronic Health Record Implementation", *The Review of Business Information Systems*, 13(4), pg. 21

Jha, A. K., DesRoches, C. M., Kralovec, P. D. & Joshi, M. S. (2010), "A Progress Report On Electronic Health Records In U.S. Hospitals", *Health Affairs*, 29(10), pg. 1951

Kulkarni, V. A. (2006), "Implementation of Electronic Health Records: Modeling and Evaluating Healthcare Information Systems for Quality Improvements in the U.S. Healthcare Industry" Ph.D. dissertation, Capella University.

Lohr, Steve (2008), "Most Doctors Aren't Using Electronic Health Record," The New York Times, June 19.

Lorenzetti, J (2003). "Technology: Blending RIS and PACS," *Medical Imaging*, February, p. 10.

Miller, R. H. and West, C. E. (2007), "MARKETWATCH: The Value Of Electronic Health Records In Community Health Centers: Policy Implications", *Health Affairs*; 26(1), pg. 206

Ondo, K and Hess, J. (2005) "Steady Progress with CPOE Deployment," *Hospitals and Health Networks*, August 13.

Podichetty, V., & Penn, D. (2004), "The Progressive Roles of Electronic Medicine: Benefits, Concerns, and Costs". *The American Journal of the Medical Sciences*, 238(2), 94-99.

Poon, E. G., Blumenthal, D., Jaggi, T., Honour, M. M., Bates, D. W., & Kaushal, R. (2004), "Overcoming Barriers To Adopting And Implementing Computerized Physician Order Entry Systems In U.S. Hospitals". *Health Affairs*, 23(4), 184-190.

Stikeman, A. (2001), "Electronic Medical Records," *Technology Review*, vol. 104, no. 8, p. 28.

Torda, P., Han, E.S., and Scholle, S.H. (2010), "Easing The Adoption And Use Of Electronic Health Records In Small Practices", *Health Affairs*, 29(4), pg.668

Valerius, J. D. (2007), "The Electronic Health Record: What Every Information Manager Should Know", *Information Management Journal*, 41(1), pg. 56

Weber, D. O. (2005), "The state of the electronic health record in 2005", *Physician Executive*, 31(4), 6-10.