ENABLING FACTORS FOR ACHIEVING GREATER SUCCESS IN ELECTRONIC MEDICAL RECORD INITIATIVES

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Abstract: The introduction of Electronic Medical Record (EMR) systems in the healthcare industry has brought anticipation as to whether the use of the system is enabling or constraining healthcare providers' efforts in providing efficient healthcare services and evidence-based practice. Although few EMR systems have managed to achieve success in the healthcare industry, many have failed to meet the expectations of healthcare providers and the general public. In this paper, a literature review was used to explore the possible trends or factors which may help future electronic medical record initiatives achieve greater success and less failure. The practical and research implications for implementing successful EMR initiatives are also discussed.

1 INTRODUCTION

The practice of collecting and storing patient's information in computerized medical information systems, rather than paper charts has increasingly gained popularity amongst many healthcare providers (Adler-Milstein and Bates, 2010; Harrison and Ramanujan, 2011; Hsieh, 2010). In their attempt to promote awareness about the under-utilization of Information Technology in the healthcare sector, Adler-Milstein and Bates (2010) noted that the use of computerized medical information systems have the potential to support evidence-based practice and transform how care is delivered to patients. Adler-Milstein and Bates (2010) posited that Information Technology is "increasingly being considered a natural tool for aiding providers, as computers can easily store up-to-date information on domains like medications and their contraindications" (p. 120). These considerations have accelerated the development of Electronic Medical Record (EMR) systems and promoted their continuing use and adoption in medical practice.

However, the introduction of EMR systems in the healthcare industry has also brought anticipation as to whether the use of the system is enabling or constraining healthcare providers' efforts in providing efficient healthcare services and evidence-based practice. Although few EMR systems have managed to achieve success in the healthcare industry, many have failed to meet the expectations of healthcare providers and the general public (Gagnon et al., 2010). This failure has resulted in the slow implementation of EMR initiatives in the healthcare industry (Boonstra and Broekhuis, 2010; Brooks and Grotz, 2010).

The objective of this paper is to explore the possible trends or factors which may help future electronic medical record initiatives achieve greater success and less failure. The first part of the paper gives an overview of electronic medical record. In the second part, the focus is on the enabling factors that will enable future EMR initiatives to achieve greater success. The third part discusses the practical and research implications for implementing successful EMR initiatives.

2 METHOD

A literature review, based on research articles from 2001 to 2011, was used to explore the possible trends or factors which may help future electronic medical record initiatives achieve greater success and less failure. The methodology involves a review of relevant publications, found and accessed with the help of ProQuest (with multiple databases option) and EBSCOhost databases. Additional sources were

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retrieved using the SAGE Journals Online, ScienceDirect, Google Scholar, and ACM digital libraries. The targeted search terms consisted of the combination of keywords and/or phrases including: (a) electronic medical record; (b) electronic medical record AND success factors; (c) electronic medical record AND success; and (d) electronic medical record AND interoperability.

Overall, 467 articles were identified and 34 of them were reviewed in full. Findings from the reviewed papers are synthesized, paraphrased (in some cases quoted) and categorized under four broad themes: *Overview of Electronic Medical Record; Enabling Factors; Research and Practical Implications;* and *Conclusion.* Studies were included in the analysis if they reported on successful factors to implementing and using electronic medical record.

3 OVERVIEW OF ELECTRONIC MEDICAL RECORD (EHR)

Electronic Medical Record (EMR) may be defined as a modern computerized medical information system that collect, store, share, and display patient information (Boonstra and Broekhuis, 2010; Brooks and Grotz, 2010; Hsieh, 2010). EMR systems are the newest form of documenting and storing pertinent patient's information including demographics, medical history, allergies, diagnosis, procedures, prescriptions, medications, laboratory results, and insurance information (Brooks and Grotz, 2010; Venkatraman et al., 2008). Beiter, Sorscher, Henderson, and Talen (2008) emphasized on the importance of EMR in the healthcare industry by asserting that EMR systems are the future of primary care.

EMR is not an Electronic Health Record (EHR), which in itself is essentially a "repository of information regarding the health status of a subject of care in computer processable form, stored and transmitted securely, and accessible by multiple authorized users" (International Organization for Standardization (ISO/TC 215), 2005, p. 2). The EMR is, however, a special case of the EHR restricted in scope to the medical domain (ISO/TC 215, 2005). EMR systems have the potential to revolutionalize and transform healthcare delivery by increasing efficiency of healthcare services; and improving quality of care and patient satisfaction (Al-Azmi et al., 2009; Beiter et al., 2008; Williams and Boren, 2008).

The benefits of adopting EMR systems in the healthcare domain are enormous (Jones & Kessler, 2010). The principal benefits for using EMR systems are their capabilities to increase adherence to clinical practice guidelines; enhance surveillance and monitoring; facilitate clinical decision-making process; decrease medication errors; reduce paper, printing and transcribing costs; improve availability of charts, improve co-ordination of care; increase legibility of clinical data; and improve quality of care, safety, and patient education (Beiter et al., 2008; Jones and Kessler, 2010; Linz and Fallon Jr., 2008; Shachak et al., 2009; Williams and Boren, 2008). Despite its enormous benefits, many healthcare organizations have been slow to adopt the EMR technology (Jones and Kessler, 2010; McGrath et al., 2007). This is partly due to several factors that act as barriers to the successful implementation of EMR initiatives.

4 ENABLING FACTORS

In a case study conducted to explore factors that have continuously influenced the successful implementation of EMR systems, Gagnon et al. (2010) identified six key enabling factors to be critical: individual factors; professional factors; organizational factors; contextual, political, and financial factors; legal factors; and technological factors. The following sections describe how these six factors, proposed by Gagnon et al. (2010), can be applied effectively and successfully to EMR initiatives.

4.1 Individual Factors

Gagnon et al. (2010) identified individual factors to comprise of both personal characteristics and attitudes of healthcare providers. According to Gagnon et al. (2010), identifying individuals within an organization who exhibit unique characteristics and greater openness to technology adoption will serve as an agent of change. Klehr, Hafner, Spelz, Steen, and Weaver (2009) echoed similar assessment by noting that one of the key factors to implementing successful EMR systems involves close collaboration amongst individual staff members and information technology staff with close support from the project leader.

Drawing upon the ethnographic study by Ventres et al. (2006), Beiter et al. (2008) noted that patients' attitudes and comfort with computers influenced their beliefs and concerns about the use of EMR

systems. Clinicians and other healthcare practitioners' openness to change and familiarity with informatics may play a crucial role in explaining variability in adoption between individuals within the same profession (Gagnon et al., 2010). The implementation of EMR systems may be resisted if users are deficient in computer skills and are not satisfied with the system design (Al-Azmi et al., 2009; Van Der Meijden et al., 2003). However, professionals in the healthcare industry who are knowledgeable about computers and open to change will embrace the adoption of EMR systems without much resistance.

4.2 Professional Factors

The professional factors focus on the workload, workflow, and teamwork processes in a local clinical setting (Gagnon et al., 2010). Many clinicians work in a time-constrained environment with heavy schedule and frequent interruptions. EMR systems are, therefore, used by time-pressured and frequently interrupted healthcare providers, many of whose workflows are too idiosyncratic for effective automation (Walker, 2005). Thus, fostering the adoption of EMR initiatives requires the development of healthcare information systems that is enabling and not constraining to the workflow of clinicians.

For the EMR systems to be truly useful and successful, Clarke, Hartswood, Procter, and Rouncefield (2001) and Hoffmann (2009) noted that the technology and work practices must be able to co-evolve and fit seamlessly into clinicians' routine workflow. Specifically, Clarke et al. (2001) noted that "IT design and development methodologies must support user-led change processes, adapting the technology to meet users' needs as these emerge through use" (p. 170). It is therefore very important that EMR systems are strategically aligned with clinical and administrative processes (Venkatraman et al., 2008).

4.3 Organizational Factors

The premise of organizational factors focuses on leadership and a presence of a champion (Gagnon et al., 2010). Successful implementation of EMR initiatives will require a leader who will champion the development of EMR systems. Canada Health Infoway (2011) suggested the need for the project leader and/or champion to take charge in the implementation of EMR systems. Gagnon et al. (2010) found that active involvement of the project champion in system design, coupled with on-site technical support to all users were the solutions put forward to help overcome most of the obstacles facing the adoption of EMR systems in clinical settings.

Organizations pursuing EMR initiatives should have in place an availability of evidence-based implementation strategy. Klehr et al. (2009) emphasized on the need to use readily available expert resources. These expert resources should be researched, well-thought, and developed by the project leader/champion before the initiation of the EMR project. Gagnon et al. (2010) found that the existence of a planned strategy based on the literature on Information and Communication Technology (ICT) adoption played an important role in the implementation of EMR systems.

The organization's innovation culture and openness to change is also very critical in influencing the success of EMR initiatives. According to Gagnon et al (2010), "the state of organisational readiness for change not only affects the computerisation of the medical record, but also everything that it involves in terms of changes" (p. 36). Boonstra and Broekhuis (2010) reaffirmed that the success of EMR initiatives depends on the quality of change management and thus the process of implementing EMR initiatives should be treated as change management projects and led by implementers and/or change managers knowledgeable in medical practices.

4.4 Contextual, Political, and Financial Factors

The context in which the EMR initiative is undertaken is very important in establishing success. Introducing the EMR technology into "complex work and organizational settings are often unpredictable, and can only be determined in the context of use" (Clarke et al., 2001, p. 170). There exist differences in how the implementation of the EMR technology is embraced in the rural setting versus urban settings. Al-Azmi et al. (2009) and Williams and Boren (2008) also identified differences on how they are embraced in developed versus developing countries. Acknowledging the fact that most developed countries implement EMR systems because of its associated benefits, Williams and Boren (2008) noted that the transition from the traditional paper-based system to EMR systems often brings some level of fear and resistance to change in the developing countries. These

perceptions have undermined the widespread adoption of EMR systems in the healthcare industry.

The political will to invest in EMR initiatives is essential in achieving success in their implementation (Jones and Kessler, 2010). The government readiness and willingness in supporting EMR initiative is always helpful in launching the project in a given national setting or climate (Gagnon et al., 2010). For example, in a study conducted in Taiwan to identify factors that affect hospitals' willingness to implement EMR initiatives, Chang, Hwang, Hung, Kuo, and Yen (2009) found that perceived benefits, uncertainty, influence and reciprocal investments had significant impact on the decision to implement EMR initiatives.

The success of EMR initiatives also depend on the availability of funding (Brooks and Grotz, 2010; Callan and DeShazo, 2007; Canada Health Infoway, 2011; Cavolo, 2007; Gagnon et al., 2010; Kumar and Aldrich, 2010). Brooks and Grotz (2010) even made it clearer by noting that funding is the largest setback to implementing EMR initiatives. The use of health information systems and their associated technical support all require significant financial investment and ongoing maintenance. Gagnon et al. (2010) emphasized on the importance of financial investment by noting that implementing EMR systems require additional costs in terms of equipment, contracts and human resources. Such additional costs may include restructuring workflow in clinical settings; knowledge transfer to employees; and in-house IT support and training (Beiter et al., 2008; O'Neill and Klepack, 2007). Inadequate training of personnel is a disaster for EMR adoption (Callan and DeShazo, 2007). Williams and Boren (2008) considered in-house training of healthcare providers as one of the key elements to the success of EMR initiatives.

4.5 Legal Factors

The healthcare industry is plagued with legal actions when it comes to the accessibility of personalized health information contained in an electronic format. According to Myers, Frieden, Bherwani, and Henning (2008), the availability of personalized health information in electronic format threatens the integrity, confidentiality, security and privacy of health data. Unauthorized access to these personalized data often leads to liabilities that require proper security protocols and management from the part of the healthcare provider.

Successful implementation and adoption of EMR systems has been slow and a long process because of privacy and confidentiality policies surrounding the use of the system (Brooks & Grotz, 2010). The United States Congress enacted the Health Insurance Portability and Accountability Act (HIPAA) in 1996 with the goal of setting up regulations to standardize the collection, storage, and dissemination of personalized health information (Brooks and Grotz, 2010; Harrison and Ramanujan, 2011; Hoffmann, 2009). However, the implementation of these regulations regarding the secure exchange of clinical information between the various EMR users across settings of care is not an easy endeavour and still represents a complex issue (Gagnon et al., 2010, p. 37). Brooks and Grotz (2010) also made similar assessment by noting that "it is commonly acknowledged that the regulation is insufficient to cover the new and swiftly developing e-health environment presented as a result of the EMR system" (p, 76). For example, HIPAA does not address data ownership (Hoffmann, 2009).

Williams and Boren (2008) therefore recommended the need for the development of privacy, confidentiality, and security principles to protect patients' interests against inappropriate access to their personalized health data. The introduction of proper IT Governance framework that establishes control and accountability of health data will also be fruitful in protecting the integrity of personalized health information. Kahn, Aulakh, and Bosworth (2009) correctly noted that widespread consumer acceptance and adoption of healthcare information systems is not possible until all issues relating to data security, identity protection, and consumer satisfactions are resolved by dedicated national bodies.

4.6 Technological Factors

There are uncertainties or disagreements amongst healthcare IT professionals on the appropriate core components of EMR systems (Hsieh, 2010). Hseih (2010) argued that most of the core components of EMR systems have typically been drawn from marketing campaigns of products rather than from standard specifications. Establishing appropriate core components of EMR systems requires technologies that utilize *health data standards* and *interoperability*.

4.6.1 Health Data Standards

Health data standards are critical for developing the core components of the EMR system. The standards need to explicitly specify how data is presented,

captured, stored, and conveyed (W. Hammond, Bailey et al., 2010). The idea of using health data standards is to enable disparate EMR systems to exchange clinical information in an integrated healthcare environment, thereby, facilitating greater integration and cohesion of healthcare services (Clarke et al., 2001). The health data standards should support the collection, storage, exchange, and retrieval of electronic medical information for the EMR system (Hoffmann, 2009).

Similarly, W. E. Hammond (2005) claimed that health data standards are needed in order to create aggregated, patient-centric EMR systems. W. E. Hammond (2005) went further and recommended the need for the "creation of a neutral, nonprofit organization in the private sector with the authority to manage all aspects of health data standards" (p. 1213). According to Venkatraman et al. (2008), the use of clinical data exchange standards in EMR systems is one of the key strategies in ensuring that EMR systems deliver business value to the healthcare IT community. The availability of health data standards is very useful in supporting the interoperability of EMR systems.

4.6.2 Interoperability

Interoperability is one of the main enabling technologies for the utilization of EMR in integrated healthcare information systems. W. Hammond et al. (2010) defined interoperability as the "ability to communicate and exchange data accurately among different IT systems, software applications, and networks" (p. 284). The interoperability concept is divided into three distinct levels of functionality: interface engine, functional interoperability, and semantic interoperability (Freedman, 2007; ISO/TC 215, 2005).

Acknowledging the fact that semantic interoperability is the most sophisticated form of interoperability, Freedman (2007) indicated that semantic interoperability "allows two systems not only to share information, it also enables the receiving system to understand and make use of the incoming data while maintaining the original meaning of that data" (p. 50). These functionalities of interoperability have facilitated the development of classification and terminology standards that are currently used in the development of EMR systems. W. Hammond et al. (2010) noted that interoperability cannot be achieved without the existence of health data standards that are agreed upon by dedicated national bodies.

5 PRATICAL AND RESEARCH IMPLICATIONS

The benefits of using EMR systems in medical practice are numerous. The use of EMR systems will enable physicians at the point of care to provide evidence-based medicine and improve the efficiency of healthcare delivery. Healthcare providers are capable of influencing the implementation of effective EMR systems if they are passionately committed to transforming the ways they provide care for patients (Walker, 2005). Improvement in clinical outcomes depends heavily on the successful implementation and adoption of EMR systems (Diamond & Shirky, 2008).

Using a phase implementation approach will ensure that all the critical success factors identified in the paper are applied appropriately to EMR initiatives. Walker (2005) noted that an "EMR implementation that is capable of supporting less error-prone care processes will require substantial resources for workflow analysis, software configuration, testing, and user training" (p, 1118). There is a general consensus among many researchers that successful implementation of EMR initiatives will require good planning, strong management and physician leadership, supportive staff, and ongoing IT support (Gagnon et al., 2010; Williams and Boren, 2008).

Establishing semantic interoperability in EMR systems is one of the critical factors in ensuring that EMR initiatives are successful with less failure. The lack of standards and structured data definitions for EMR systems contributes to the difficult in achieving interoperability in many existing EMR systems (Kumar & Aldrich, 2010). Hence, developing an integrated IT architecture and infrastructure to support EMR systems will enable hospitals to get better results and provide high quality services to patients.

Achieving successful implementation of EMR initiatives will also require some trade-offs. Acknowledging the fact that there exists a trade-off between achieving rapid implementation of EMR technology and strong healthcare privacy laws, Brooks and Grotz (2010) noted that while healthcare privacy laws remain positive for healthcare consumers, it does not always allow for quick EMR systems implementation. Accommodating this trade-off will involve finding the right balance between standardization and flexibility. Whereas standardization ensures interoperability and secure exchange of clinical information, flexibility accommodates the various systems and architectures

that different healthcare providers need (Hoffmann, 2009).

6 CONCLUSIONS

This paper has explored the possible trends or factors which may help future EMR initiatives achieve greater success and less failure. Healthcare providers are encouraged to develop strategic initiatives to influence the successful adoption of EMR systems. There is an expectation that low implementation cost and making the technology appealing to physicians will stimulate and accelerate the adoption of EMR initiatives in medical practice (Bristol, 2005). Although several challenges are facing the adoption of EMR in medical practice, there is strong evidence from the literature that when properly developed and deployed, EMR systems will benefit the healthcare community in establishing efficient and quality healthcare delivery and evidence-based practice (Al-Azmi et al., 2009; Beiter et al., 2008; Williams and Boren, 2008).

EMR systems continue to remain attractive to many healthcare providers. However, the cost of ownership cannot be ignored (Callan and DeShazo, 2007; Cavolo, 2007; Kumar and Aldrich, 2010; O'Neill and Klepack, 2007; Venkatraman et al., 2008). The cost of owning EMR systems does not come with other needed day-to-day operational maintenances and upgrade to the systems as well as technical support. With the looming cost of ownership of the EMR systems, many researchers have recommended the need for the availability of evidence-based implementation strategy to guide project leaders (Chang et al., 2009; Gagnon et al., 2010). Gagnon et al. (2010) found that the involvement of project leaders in systems design, as well as on-site technical support to all users are very critical in helping overcome the obstacles facing the adoption and implementation of EMR initiatives.

Change management also plays an important role in the successful implementation of EMR initiatives (Boonstra and Broekhuis, 2010). The development of appropriate and strategic change management processes in healthcare organizations could be an incentive to accelerate the adoption in EMR systems in medical practice. Healthcare providers and policy makers can promote EMR initiatives by identifying desirable stakeholders and partners that will form a strategic alliance to meet the dynamic challenges in the healthcare industry (Chang et al., 2009; Clarke et al., 2001). Future research should therefore focus on developing an appropriate IT governance structure or framework that will guide project leaders in championing the successful implementation of EMR initiatives.

REFERENCES

Adler-Milstein, J., and Bates, D. W. (2010). Paperless healthcare: Progress and challenges of an IT-enabled healthcare system. *Business Horizons, 53*(2), 119-130. doi:10.1016/j.bushor.2009.10.004

Al-Azmi, S., Al-Enezi, N., and Chowdhury, R. I. (2009). Users' attitudes to an electronic medical record system and its correlates: A multivariate analysis. *Health Information Management Journal, 38*(2), 33-40.

Beiter, P. A., Sorscher, J., Henderson, C. J., and Talen, M. (2008). Do electronic medical record (EMR) demonstrations change attitudes, knowledge, skills or needs? *Informatics in Primary Care, 16*(3), 221-227.

Boonstra, A., & Broekhuis, M. (2010). Barriers to the acceptance of electronic medical records by physicians from systematic review to taxonomy and interventions. *BMC Health Services Research, 10*, 231-247. doi:10.1186/1472-6963-10-231

Bristol, N. (2005). The muddle of US electronic medical records. *The Lancet, 365*(9471), 1610-1611.

Brooks, R., & Grotz, C. (2010). Implementation of electronic medical records: How healthcare providers are managing the challenges of going digital. *Journal of Business & Economics Research, 8*(6), 73-84.

Callan, C. M., & DeShazo, C. (2007). How to navigate health care information technology and electronic medical records. *Physician Executive, 33*(6), 36-42.

Canada Health Infoway. (2011). *EMR success factors*. Retrieved April 21, 2011, from https://www.infoway-inforoute.ca/working-with-ehr/health-care-providers/emrs/success-factors

Cavolo, D. (2007). Electronic medical record systems: Know the total cost of ownership: Long term management care. *Long-Term Living, 56*(7), 17-19.

Chang, I., Hwang, H., Hung, M., Kuo, K., & Yen, D. C. (2009). Factors affecting cross-hospital exchange of electronic medical records. *Information & Management, 46*(2), 109-115. doi:10.1016/j.im.2008.12.004

Clarke, K. M., Hartswood, M. J., Procter, R. N., & Rouncefield, M. (2001). The electronic medical record and everyday medical work. *Health Informatics Journal, 7*(3-4), 168-170. doi:10.1177/146045820100700310

Diamond, C., & Shirky, C. (2008). Health information technology: A few years of magical thinking? *Health Affairs, 27*(5), 383-390.

Freedman, I. (2007). What does "interoperability" really mean? *Health Management Technology, 28*(10), 50-51.

Gagnon, M., Desmartis, M., Labrecque, M., Légaré, F., Lamothe, L., Fortin, J., Rancourt, J., and Duplantie, J. (2010). Implementation of an electronic medical record in family practice: A case study. *Informatics in*

Primary Care, 18(1), 31-40.

Hammond, W., Bailey, C., Boucher, P., Spohr, M., & Whitaker, P. (2010). Connecting information to improve health. *Health Affairs, 29*(2), 284-288.

Hammond, W. E. (2005). The making and adoption of health data standards. *Health Affairs, 24*(5), 1205-1213.

Harrison, P. J., & Ramanujan, S. (2011). Electronic medical records: Great idea or great threat to privacy? *The Review of Business Information Systems, 15*(1), 1-7.

Hoffmann, L. (2009). Implementing electronic medical records. *Communications of the ACM, 52*(11), 18-20.

Hsieh, C. (2010). Electronic medical record system: Current status and its use to support universal healthcare system. *Communications of the IIMA, 10*(3), 79-97.

International Organization for Standardization (ISO/TC 215). (2005). *Health informatics — electronic health record — definition, scope, and context.* Geneva, Switzerland: ISO. Retrieved from http://www.openehr.org/downloads/standards/iso/isotc215wg3_N202_ISO-TR_20514_Final_%5B2005-01-31%5D.pdf

Jones, D. S., and Kessler, H. B. (2010). Can electronic medical records really improve quality? The Obama administration bets yes. *Journal of Health Care Compliance, 12*(1), 39-42, 67-68.

Kahn, J., Aulakh, V., & Bosworth, A. (2009). What it takes: Characteristics of the ideal personal health record. *Health Affairs, 28*(2), 369-376.

Klehr, J., Hafner, J., Spelz, L. M., Steen, S., & Weaver, K. (2009). Implementation of standardized nomenclature in the electronic medical record. *International Journal of Nursing Terminologies & Classifications, 20*(4), 169-180.

Kumar, S., and Aldrich, K. (2010). Overcoming barriers to electronic medical record (EMR) implementation in the US healthcare system: A comparative study. *Health Informatics Journal, 16*(4), 306-318. doi:10.1177/1460458210380523

Linz, A. J., and Fallon Jr., L. F. (2008). Public perceptions regarding the impact of electronic medical records on health care quality and medical errors. *Journal of Controversial Medical Claims, 15*(2), 10-15.

McGrath, J. M., Arar, N. H., & Pugh, J. A. (2007). The influence of electronic medical record usage on nonverbal communication in the medical interview. *Health Informatics Journal, 13*(2), 105-118. doi:10.1177/1460458207076466

Myers, J., Frieden, T. R., Bherwani, K. M., & Henning, K. J. (2008). Privacy and public health at risk: Public health confidentiality in the digital age. *American Journal of Public Health, 98*(5), 793-801.

O'Neill, L., and Klepack, W. (2007). *Electronic medical records for a rural family practice: A case study in systems development* Springer Science & Business Media. doi:10.1007/s10916-006-9040-1

Shachak, A., Hadas-Dayagi, M., Ziv, A., and Reis, S. (2009). Primary care physicians' use of an electronic medical record system: A cognitive task analysis. *JGIM: Journal of General Internal Medicine, 24*(3), 341-348. doi:10.1007/s11606-008-0892-6

Van Der Meijden, M. J., Tange, H. J., Troost, J., & Hasman, A. (2003). Determinants of success of inpatient clinical information systems: a literature review. *Journal of the American Medical Informatics Association, 10*(3), 235-243.

Venkatraman, S., Bala, H., Venkatesh, V., & Bates, J. (2008). Six strategies for electronic medical records systems. *Communications of the ACM, 51*(11), 140-144.

Ventres, W., Kooienga, S., Vuckovic, N., Marlin, R., Nygren, P., and Stewart, V. (2006). Physicians, patients, and the electronic health record: an ethnographic analysis. *Annals of Family Medicine, 4*(1), 124–31.

Walker, J. M. (2005). Electronic medical records and health care transformation. *Health Affairs, 24*(5), 1118-1120. doi:10.1377/hlthaff.24.5.1118

Williams, F., & Boren, S. A. (2008). The role of electronic medical record in care delivery in developing countries. *International Journal of Information Management, 28*(6), 503-507. doi:10.1016/j.ijinfomgt.2008.01.016