



Electronic medical records: tools for competitive advantage

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Abstract

Purpose – The purpose of this article is to present a conceptual model that posits the strategic relationships between information technology, clinic operations and physicians and the subsequent outcomes to patients, physicians and clinics which can lead to competitive advantages in the healthcare environment.

Design/methodology/approach – This paper is based on a review of the literature and proposes a conceptual model of the strategic relationships essential for success. The scope of the paper is based on the legal, economic and political triggers impacting the strategic relationship between electronic medical records, clinic interoperability and physicians as owners/users.

Findings – The paper presents the formation of a conceptual model which identifies the strategic alignment between clinics, physicians and information technology, more specifically, electronic medical records.

Research limitations/implications – This paper is limited in that it is not an empirical investigation but a conceptual model of future research endeavours. Future research endeavours should seek empirical findings related to the relationships proposed in the model.

Practical implications – Physicians, clinics and patients should be aware of the impact electronic medical records have on the health environment as well as the potential competitiveness due to health consumerism enabled by electronic medical records.

Social implications – Electronic medical records, personal health records and electronic health records are infiltrating society; subsequently health consumers should determine how this technology may impact their healthcare.

Originality/value – The value of this paper is to provide a conceptual model as a basis for future empirical research and awareness of changes in the competitiveness of the healthcare environment.

Keywords Information technology, Clinic operations, Physicians, Electronic medical records, Competitive advantage, Quality, Productivity

Paper type Conceptual paper

Introduction

The new competition in healthcare

Competitive advantage does not come from electronic medical records (EMR); the fact that a healthcare organization has implemented an EMR does not inherently provide a competitive advantage and can be associated with potential problems. However, once properly implemented, the multitude of things that the healthcare organization can do with the EMR, both within and between provider organizations can provide a competitive advantage (Glaser, 2007; Kearns and Lederer, 2003). Healthcare workers can leverage the power of EMR technology and create a competitive advantage via



communities of knowledge workers (Tan and Modrow, 1999). However, a need exists to understand the strategic relevance of healthcare information systems such as EMR within and across healthcare organizations for efficiency, effectiveness, intelligence and appropriateness of care (Tan and Modrow, 1999).

Changes in technology, and the growing implementation of fully EMR, are forcing healthcare environments to evolve. Technical innovation in healthcare has been lacking due to weak market competition; typically market competition breeds innovation (Rothenberg, 1995). Recent changes have caused the healthcare industry to view IT as a fundamental asset in providing healthcare information and decision support that assists with handling rising costs and improving quality of care in order to gain and sustain a competitive advantage (Raghupathi and Tan, 2002).

EMR provide a way to gather, store, retrieve and analyze medical information. Medical information and the resulting analysis are then used to provide information to physicians so that they can pursue the best treatment and quality care for the patient. Coordination of information via the EMR system among the patient, the physician and the clinic is necessary for a strategic relationship to result. The technology presented in our proposed conceptual model, EMR, provides utilization of information to and from the patient, physician and clinic. With each participant serving as both an informer to the system and a client of the system, the unique relationships between the users and the systems and relationships among the users, provides opportunities to achieve a competitive advantage. With strategic relationships and trans-disciplinary understanding, the implementation of EMR can lead to efficient and effective patient, physician and clinic outcomes.

EMR became a serious topic of discussion and subsequent implementation in 2004 when President Bush put forth a strategic initiative to implement healthcare industry-wide EMR in the USA by 2014 (Dixon, 2007). President Bush supported the need for a twenty-first century system to replace the nineteenth century paperwork system that was currently in place ("N.J. EMR program gets federal funding", 2006). In addition, President Obama signed the American Recovery and Reinvestment Act of 2009 into law with one of the goals to establish a nationwide electronic network for healthcare improvement (Maffeo, 2009). Not only are there financial incentives for the adoption of EMR beginning in the year 2011, but there are also penalties in place for healthcare providers that do not adopt EMR by 2015 (Maffeo, 2009; Terhune *et al.*, 2009). President Obama expects the changes to improve care, eliminate errors and save billions of dollars a year (Terhune *et al.*, 2009). EMRs are utilized for core processes and for efficiencies in clinic business operations; when used appropriately EMR's can lead to competitive advantages. For example, integration of clinical, financial and demographic information related to prior medical treatment enables providers to share information and make clinical decisions more effectively. EMR's can also enable clinic operations to run more smoothly via integration with appointment scheduling, billing, and electronic filing and coding.

Conceptual model

Information technology (IT) in healthcare changes the environment of practice because the physician, the clinic work flows and the technology infrastructure are tightly interrelated (Stead, 2007). We argue that these three components must be aligned in their strategic goals and objectives to realize positive outcomes leading to

competitive advantage. Thus, we propose a model of strategic alignment between IT, clinic operations, and physicians. Healthcare practitioners can use this model in understanding issues related to attaining competitive advantage via EMR. The model highlights the integration of IT and strategic business processes. Researchers can use this model as a theoretical basis to further explore the relationships between EMR, competitive advantages in healthcare.

To develop this conceptual model, it was necessary to understand the concept of EMR and how they relate to physicians and clinics. Also, in order to understand the competitive advantage EMR can give, it was also necessary to understand competitive advantages via technology. This conceptual model was created by examining the literature on EMR as well as discussing EMR implementation with local clinics. The literature review was conducted by examining published material for electronic health records, EMR, health information systems and personal health records. From this, the conceptual model emerged and the constructs employed within the model were further researched and modified to develop the model.

In this paper, we also provide justification for the relationships between IT, clinic operations and physicians that are necessary for efficient and effective outcomes that can lead to competitive advantages. More specifically, the utilization of IT along with the strategic relationships between the constructs leads to clinic, physician and patient outcomes which can lead to competitive advantages in the healthcare industry. We will discuss each component of the model in more detail throughout the paper. The premise of this study and proposed conceptual model is that the strategic alignment between IT, clinics and physicians leads to the outcomes that provide competitive advantage (Figure 1).

Triggers affecting strategic alignment

Healthcare organizations face factors that affect the strategic decisions that are unique to the healthcare industry. Economic, political and legal triggers all affect the strategic plan of healthcare organizations and must be recognized and worked into the strategic plan (Beazley and Lemley, 2007). Economic triggers come from third-party payers such as insurance companies, government programs and private pay. Insurance companies pay only the charges approved for procedures while healthcare facilities bill the amount deemed necessary. This causes discrepancies and subsequent disputes over billed charges for healthcare and also causes inconveniences and extra work in clinic operations and for the patient. Also, the state of the economy impacts healthcare due to the nature of the payment system; even though healthcare expenditures are increasing, the offsetting revenue from healthcare services is facing limitations. Government sponsored funding is limited and third-party reimbursements are declining due to limits and increased requirements for all reimbursements (Beazley and Lemley, 2007). In addition to the limits on revenue, administrative costs have increased due to technology demands and integration requirements. Moreover, customers are seeking efficiency which puts strains on healthcare providers to increase quantity and efficiency (Beazley and Lemley, 2007). All these factors combine to make a unique economic situation for healthcare providers, particularly small healthcare providers.

Political triggers on healthcare strategic alignment come from presidential initiatives to improve nationwide healthcare. Presidential initiatives seek EMR implementation and a nationwide electronic network so that healthcare can run

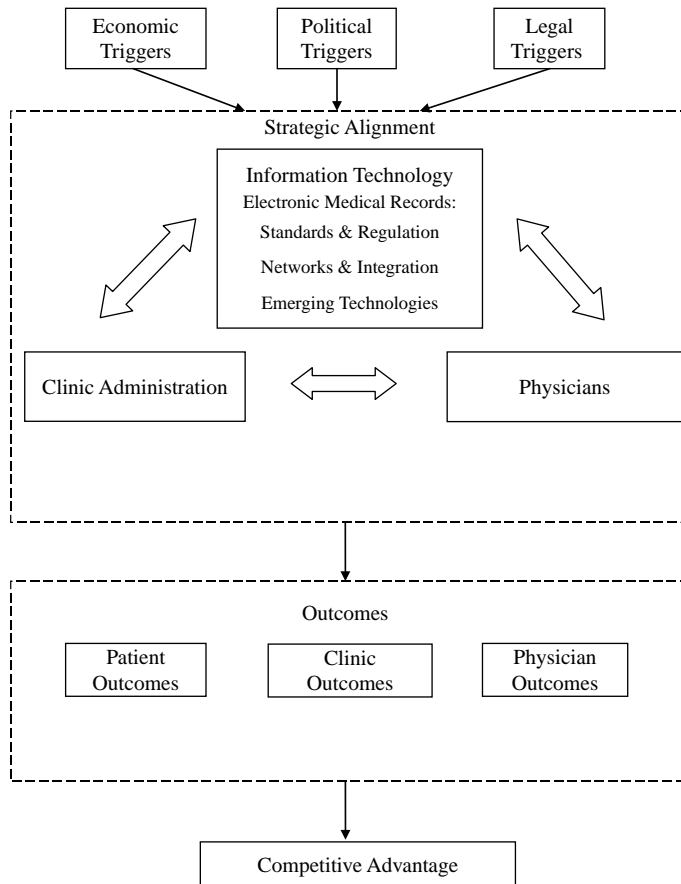


Figure 1.
Conceptual model

efficiently (Dixon, 2007; Maffeo, 2009). Physicians feel that the political pressure to adopt and integrate EMR is solely on them. In addition to the political pressures, physicians must seek justification for the time and cost involved in the adoption, face standards that may or may not integrate and lack governmental support to back up the initiatives. While these mandates are meant to reduce medical errors, bring better, consistent care, and reduce costs, these mandates might also drive out the physicians who are intended to implement the technology that will lead to these benefits (Bierstock, 2009). As a result of the political pressure to move toward updated systems, physicians feel pressure to document, assess and include every piece of available information and in turn need the assurance that the systems are strategically managed within their practice so that they can do their jobs without apprehension or fear (Bierstock, 2009).

Legal triggers are also impacting the strategic relationships between IT, clinic operations and physicians. Among other things, hospitals, managed care facilities and sole practitioners, as strategic healthcare providers, must work to fulfill government initiatives for recordkeeping and integration (Dunbar *et al.*, 2007). As part of the

stimulus bill signed by President Obama, health IT has new requirements and rules. The Health Insurance Portability and Accountability Act (HIPAA) rules were updated, the Office of the National Coordinator for Health Information technology was provided oversight duties, a Health Information Technology Standards Committee was mandated and federal privacy and security laws were strengthened in regard to health information (Maffeo, 2009). Legal requirements provide that the added requirements and rules should be in force with the implementation of EMR, therefore a strategic relationship between the technologies (EMR), the clinic operations and the physicians is necessary for fulfillment of the requirements of the legal triggers.

IT strategy via EMR

Strategic use of IT is important in developing relationships between IT usage and performance measures (Dehning and Richardson, 2002). Strategic planning includes a long term view of the specific application of IT required to gain competitive advantage while fulfilling the business goals of the organization. A detailed long-range vision and plan are necessary for successful strategic initiatives through the use of measures of accomplishments (Davis and Adams, 2007). The strategy should go beyond the purchase of IT to the identification of ways to create IT capability (Bharadwaj, 2000). The capability comes from IT staff, IT infrastructure and IT business relationships working toward strategic alignment (Ross *et al.*, 1996; Bharadwaj, 2000). These capability components come from the integrated relationship between the clinic, the physicians/owners and the IT. More specifically, the components of IT in our model for strategic alignment focus on IT standards and regulation, networks and integration for alignment and emerging technology. All three of these IT initiatives will be discussed within the context of EMR.

Standards and regulation for advantages of integration in clinics. The goal of effective EMR industry-wide usage is integration and storage of structured documents, personal healthcare information, medical images and other data types along with the ability to access and share across all healthcare networks (Davis and Adams, 2007). For effective movement and management of information, integration and sharing must involve many parties including purchasers, providers, payers and patients (Rothenberg, 1995). IT standards of terminology, coding, systems, networks, and software applications are necessary for interoperability so that healthcare providers speak the same language and work together (Bennett, 2009). With standards and subsequent integration and the ability to share, future technologies such as software agents that interact and negotiate on behalf of human principals may build on this integration and enable providers to deliver enhanced competitive benefits (Smith, 2008).

Researchers posit that EMRs are most successfully implemented when associated with assurances that the EMR software's chosen standards support and enable use of existing technology (Davis and Adams, 2007; Bennett, 2009). Standards can: minimize costs, maintain quality, simplify integration, and speed delivery (Ross *et al.*, 1996). Even though the trend is to move toward EMR that enables standards, the standards embedded and used in EMR software systems are not necessarily well defined and accepted industry-wide (Raghupathi and Tan, 2002). Industry-wide standards are the next logical step in EMR and will enable electronic and digital networking. Currently, the National Health Information Network is developing standards to build a nationwide infrastructure for sharing health data (Bennett, 2009). Careful study and

discussion of standards implementation is necessary for effective adoption and use. The high degrees of integration and standardization that are enabled by IT can lead to more efficient business processes and transformed operations (Venkatesh *et al.*, 2007).

Networks and integration for alignment with third-parties. By creating business relationships that enable efficient and effective performance of IT integration, information networks facilitate the strategic use of IT in healthcare organizations (Rothenberg, 1995). Identification of competitive forces in healthcare organizations is part of the strategy and should drive the integration of EMR adoption and their use in an organization (Kim and Michelman, 1990). The top strategy for EMR systems is to develop integrated IT architectures to support the effective and efficient implementation of the healthcare system (Venkatraman *et al.*, 2008). Integration studies indicate that most process alignment will be internal to the organization, but there will be processes that must align between organizations (Glaser, 2007). Since one of the advantages of EMR is the ability to integrate with shared standards, organizations must take advantage of the internal processing EMR can provide by enabling third-party integration with other providers, payers and patients.

The use of information is a key component of competitive advantage in healthcare organizations. The information is sharable within an organization or between organizations and used as a valuable resource to enhance organizational knowledge (Kearns and Lederer, 2003). Not only the access and use of information, but the quality of information is enhanced via IT and effective enterprise architecture (Venkatesh *et al.*, 2007). For example, the Veterans Health Administration (VHA) was successful in transforming its operations to become a leader in healthcare via strategic alignment. Through the use of IT, the strategic alignment of the VHA led to more integration and standardization of business processes both within and outside the organization (Venkatesh *et al.*, 2007). Integration provides access to information regarding quality and cost. Integration and appropriate technology will enable healthcare organizations to become long-term leaders when industry-wide integration is required (Odorisio and Piescik, 1998). With these information characteristics as the basis for delivery of high quality and low cost healthcare, clinics can proceed in using this data as knowledge in a competitive way to provide sustenance for their practice. The combination of IT, business processes, customer orientation, and distribution can create a set of resources that cannot be easily matched by other healthcare providers (Bharadwaj, 2000).

Emerging technology and the need to integrate efficiently. The strategic alignment of the healthcare organization should be designed for IT facilitators to analyze and subsequently integrate emerging technology as it becomes available. Being a leader in emerging technology adoption can give an organization increased market share, customer base protection, an enhanced reputation, and name recognition all of which lead to increased financial performance (Zahra *et al.*, 1995). In order to expedite the evaluation of emerging technologies for strategic alignment within the organization, administrators and physicians should: review new technologies on a continuous basis, maintain information on emerging technologies, define business processes so that a quick overview of integration is visible, read trade journals and online publications, listen to other physicians, get overviews of the technology and ask questions (Cegielski *et al.*, 2005). By being prepared to analyze these new technologies, healthcare organizations become ready to focus on the most critical issues to their strategy in the fast-paced technology-changing environment (Tan and Modrow, 1999).

The adoption rate for EMR in small clinics is low (Dunbar *et al.*, 2007). When technological diffusion is low in an industry, adopting emerging technologies is advantageous to healthcare organizations (Zahra *et al.*, 1995). The IT facilitator in the organization, whether a part of the administration or the physicians or a combination of the two, must focus on the design and development of IT to capture, organize, store and present healthcare information in new ways and replace or upgrade technology as needed to stay competitive (Raghupathi and Tan, 2002). Since the adoption rate is low, the early adopters of EMR can gain a competitive advantage via the new technology. A competitive advantage is gained and maintained when a company develops and commercializes an emerging technology for growth and financial performance (Zahra *et al.*, 1995).

Strategic alignment: IT, physicians and clinics

IT linkage with clinic administration. EMR's impact clinic operations through streamlined scheduling via appointment reminders, integration of billing with procedures for faster processing and collections, sharing of clinical data for facilitation of diagnosis and avoidance of duplication of testing, control of pharmaceutical requirements and paperless filing which allows for faster access and less errors (Lamont, 2005; Mitchell, 2008). However, in order for the IT impact to be fully recognized, the strategic IT plan should align with the business plan (Kearns and Lederer, 2003). Healthcare organizations need to look beyond simply operationalizing traditional business processes with IT and toward finding ways to use IT to support competitive challenges of *ad hoc* or poorly structured tasks (Raghupathi and Tan, 2002). Strategy in healthcare aims to provide high level end-users with the informational structure and content necessary to make efficient and effective decisions (Tan and Modrow, 1999). IT should not only be utilized, it should be utilized in a way that supports the intended task – such use can provide quality care efficiently and effectively (Pendharkar *et al.*, 2001).

Early adoption of IT requires attention to the healthcare worker's skills, administration's capabilities and the organization's resources (Zahra *et al.*, 1995). One of the ironies in healthcare is the speed at which patient care technology has increased while administrative technological capabilities have fallen behind (Cottrell, 2005). It is critical that healthcare IT administrators understand users and the context in which they work in order to gain effective implementation (Sallas *et al.*, 2007). EMR implementation requires practices to move from their historical paper-based silos to an electronic system with integrated and standardized features (Dunbar, 2002). Firms fall into "rigidity traps" and confront significant organization changes which lead to difficulties in effectively implementing new technology such as EMR (Bharadwaj, 2000). IT implementation can result in faster performance of existing practices, but poor performance or negative feedback can result in IT implemented changes which cause more problems than the organization experienced before the implementation of the new technology (Glaser, 2007). To avoid such problems clinicians should be well-trained in the technology, know how the technology fits the business process, and be equipped to correctly use the technology for problem-solving.

Since, the healthcare industry is a dynamic environment; the alignment-performance relationship must be adaptable to the dynamic changes that IT implementation can bring about (Glaser, 2007). Because the process of IT development brings about change, successful strategic implementation of EMR is a difficult challenge

(Tan and Modrow, 1999). Changes come from the way information is gathered, viewed, processed and used (Tan and Modrow, 1999). Without changes in the clinic business processes the advantages of the faster and higher quality of information collection are likely to remain underutilized. Many failures result from lack of alignment between IT and business processes (Venkatraman *et al.*, 2008). Other failures result when an organization expects the software to be the solution without the knowledge that the practice must change (Whitham and Davis, 2007).

IT's linkage with physicians. Government sponsored funding is requiring lower billing rates while administrative costs are increasing, therefore quantity and efficiency are necessary to achieve a higher quality of care at a more competitive cost (Beazley and Lemley, 2007). In determining whether or not to adopt EMR, administrators and physicians should look at a firm's IT capability through self-assessment (Bharadwaj, 2000). Adoption and implementation of IT capability in the organization allows delivery and support of applications thereby making IT adoption a competency or a liability depending on the healthcare organizations capabilities (Ross *et al.*, 1996). In this new environment the physician is a decision maker, user, administrator and possible purchaser of the EMR.

National healthcare macro environmental studies show that strategic implementation of EMR is necessary and other studies confirm that private, primary care medical groups face the same difficulties (Beazley and Lemley, 2007). Numerous studies claim that EMR adoption is inevitable in healthcare organizations (Cottrell, 2005; Rothenberg, 1995; Whitham and Davis, 2007). With interoperability due to lack of EMR integration with other providers, government and payers looming in the future, administrators and physicians should approach adoption and implementation of EMR differently than most new technologies (Whitham and Davis, 2007). For efficient and effective implementation, the commitment of adoption and subsequent use is expected from all healthcare professionals (Jensen and Aanestad, 2007). Physicians, owners, and administrative personnel along with clinical personnel must see the need for adoption and be part of the adoption planning process (Davis and Adams, 2007; Kim and Michelman, 1990). Physicians are not necessarily the best information agents due to their lack of time and internet skills, although their input into the process is essential (Uphoff and Winn, 1999). Physicians/owners see the high cost, lack of support, lack of existing IT infrastructure, and absence of architectural and strategic aspects needed for success (Venkatraman *et al.*, 2008). Physicians as owners bear the cost of the EMR system while the immediate benefits are to insurance companies, patients, and government associations.

Physicians' linkage with clinic administration. Physicians play an important role in clinical administration and operations; the involvement and support of physicians with clinic operations such as scheduling, documentation, billing, referral, prescription services, storage and data mining is very important for strategic alignment. In small, owner-operated clinics such as rural clinics or Urgent Care Clinics, physicians may assume many roles in the clinic operations and subsequent IT strategic alignment. The physician's contribution to business meetings, goal formation, and contact with administration improves alignment between business and IT strategies in order to enable competitive use of information; this alignment may explain why one healthcare organization is more competitive than others (Kearns and Lederer, 2003).

A study by Meinert (2005), reflects the general beliefs and attitudes of physicians as providers of healthcare: overall support for EMRs, expected increase in practice productivity, 75 percent belief that usage will have to be mandated, a significant amount of physicians that do not want to commit sufficient time to training and a belief by 80 percent of the respondents that benefits will outweigh the costs and therefore EMR should be implemented. Consequently, while physicians have high hopes for EMR implementation, as operators, they are hesitant to commit to implementation due to training. Therefore, in order to overcome the opposition to implementation, the focus of physicians as owners of clinics who will reap the expected financial benefits of the implementation may be needed.

Outcomes leading to competitive advantage

Patient outcomes. A new trend in healthcare is the rising trend of “health consumerism”, which involves the patients’ increased awareness of treatments, legal rights, insurance coverage, and alternative treatments (Dunbar *et al.*, 2007). Even though it may become an impetus for physicians, patients have an insatiable desire for more medical information and are gaining access to generic information via the internet (Pendharkar *et al.*, 2001). Patients are more educated about health conditions and treatments and as a result are requesting the newest and most advanced testing, medication and procedures available (Smith, 2008; Uphoff and Winn, 1999). Also, patients demand for superior healthcare, along with complexity and high medical costs, has led to a need for required improvements in the accuracy and availability of medical data for the patients (Poston *et al.*, 2007). Competitive advantage may result from giving patients access to web applications such as appointments, registration, prescription services and surveys. Using IT to embrace the patient and create trust through a long-lasting relationship, the healthcare provider can establish a winning situation with the customer (Uphoff and Winn, 1999).

One way to utilize the information that EMR provides is by treating the customer as a market segment of one and using that information to create customized offerings or to design products and services that solve customer’s problems or eliminate their burdens (Uphoff and Winn, 1999). Patients want two things: greater access and better customer service; they are tired of dealing with inefficiencies and the slow process of insurance claims, eligibility and referrals (Uphoff and Winn, 1999). Using the patients’ desire for more information and easier access, healthcare organizations can find ways to attain and sustain competitive advantage. Studies show that system responsiveness and reliability should be emphasized where companies provide client services, such as healthcare, and where information systems interface with users (Landrum *et al.*, 2009). EMR give the healthcare provider the ability to meet healthcare consumer demands for responsiveness and reliability through successful adoption, integration, and standards.

For patients, the benefits also come from a potential correlation between IT use and quality of care, lower costs and higher patient safety outcomes (Menachemi *et al.*, 2006). Using clinical outcome data, one ICU ward reported a 70 percent decrease in adverse drug reactions, significant decrease in antibiotics, a \$10,000 per patient cost savings, and a decrease in hospital stays of almost six days (Uphoff and Winn, 1999). Patient check-in, insurance verification, and payment information all become easier for the patient with EMR (Raghupathi and Tan, 2002). Patient satisfaction levels are also reported to be higher in studies that test the correlation between IT support and patient

satisfaction resulting from economic advantages, enhanced quality of care and greater accuracy (Odorisio and Piescik, 1998; Venkatesh *et al.*, 2007).

Patients can also expect higher levels of quality care due to databases of health information, decision support systems and exception reporting based on EMR data (McLeod *et al.*, 2008). One study estimated that 12 percent of US hospitals had decision support systems at the end of 2007 (Pederson and Gumpfer, 2008). With databases and decision support systems in place, researchers can analyze data to detect correlations between drugs and health problems and to investigate adverse drug interactions (Stipp, 1988). The more healthcare providers that utilize integrated EMRs, the more data will be available to provide more benefits to patients via database analysis. In addition, physicians can use EMR to automatically report adverse drug effects to the Food & Drug Administration which will also increase drug safety monitoring for patients (Page, 2009).

Use of individual healthcare information gathered, stored and shared via an EMR for analyzing and designing procedures and solution also leads to enhanced care for the patients. Demographic data stored in the EMR can lead to global health maintenance alerts that ripple through all electronic records and notify those who may be at risk (Lamont, 2005). By knowing the demographic information as well as the medical information, physicians can provide better care to vulnerable populations via risk faster assessment and preventive and chronic disease management decision support (Custodio *et al.*, 2009). For example, when EMR analysis indicates patients may be at risk due to their individual healthcare information, recommendations to set up a consultation or appointment can be sent automatically to the patient (Custodio *et al.*, 2009). Continuity of care can also improve for patients with monitoring and follow-up via computerized and integrated clinic databases (“Osteoporosis study makes clear case for EMR, follow-up program”, 2007; Baillie *et al.*, 2005).

Clinic outcomes. Research indicates that firms gain competitive advantage do so through the use of information systems designed to improve transaction and business processes (Kim and Michelman, 1990). Information systems in healthcare organizations must achieve information and decision requirements, interventions for solving problems and accountability measures of system performance while maintaining competitive advantage and providing quality care at the lowest cost (Tan and Modrow, 1999). Computers in hospitals can provide: reduced data entry and errors, elimination of steps, constant monitoring of care and cost, faster information flow and favorable positions with third-party payers (Kim and Michelman, 1990). Computerized patient records, document management systems, data warehouses, distributed networks, and telematics are all possible with electronic data entry and storage (Raghupathi and Tan, 2002). Tablet PCs utilizing EMR can eliminate dictation time, reduce chart pulls and filings, cut phone messages and decrease appointment processing times (“Less paper, less fuss, better patient care”, 2007). Removing paper charts and replacing them with EMRs can also lead to more space for clinic operations, exam rooms or space for additional storage (Rogoski, 2005).

Overall, organizations are more efficient and flexible with EMR systems when significant changes in daily operations and subsequent performance occur over time (McLeod *et al.*, 2008). Organizational benefits from improved processes are: faster processing, less errors, less expense and more convenient service for third-party payers (Glaser, 2007). More specifically, enrollment and benefit determination,

accounts receivable web applications and computerized medical record access all are features of EMR that benefit the organization directly and the patient indirectly. Storage costs decrease due to electronic storage rather than paper storage and medical transcriptionist are not necessary in many situations (McLeod *et al.*, 2008). Elimination of data redundancy due to integrated and normalized databases also leads to fewer errors and faster processing times for patients and organizations (Raghupathi and Tan, 2002). Hospital errors cost as much as \$29 billion every year (Venkatraman *et al.*, 2008).

The costs of EMR adoption are high, however the EMR system benefits can offset the high costs through the subsequent cost savings provided by the effective use of the EMR system. Some of the reported cost savings used in return on investment (ROI) calculations are: cost of specific services provided to each patient, types of treatments, time spent with patients and other factors related to patient cost savings due to EMR use (Raghupathi and Tan, 2002). Costs savings as high as \$68 per case, reduction in costs of 12.7 percent and an overall time savings of up to \$100 per case are reported in published studies; other studies showed a specific cost savings of \$500,000 per year in transportation savings due to electronic delivery of information rather than physical delivery (Dunbar, 2002; Raghupathi and Tan, 2002). While there is considerable upfront expense in adopting EMR, increased revenues can offset these costs quickly and should be considered in the evaluation of ROI (Bharadwaj, 2000).

Activities increase with EMR implementation and economies of scale are reached that aid in offsetting costs (Zahra *et al.*, 1995). Some of the greatest increases in revenue from EMR are the increase in speed of claim submission from eight to two weeks and payment without rework 50 percent of the time (Rothenberg, 1995). The integration of the diagnosis and treatment codes with the revenue cycle enable faster collections with less human interventions (Lamont, 2005; Rogoski, 2005). Other economic benefits such as increased collection times of accounts receivable and less rework for the organization result from implementation and integration of EMR (Odorisio and Piescik, 1998). In addition, the number of billing clerks can decrease and payment from third-party insurance providers, Medicare and Medicaid is faster (McLeod *et al.*, 2008; Raghupathi and Tan, 2002). Incorrect billing savings alone in one study were \$540,000 per year (Raghupathi and Tan, 2002).

Physician/owner outcomes. Healthcare leaders and physicians must learn how to value IT investments based on benefits (Menachemi *et al.*, 2006). Physicians as owners obtain benefits of EMR through financial gains from increased business through efficient operations and greater patient satisfaction and referral. Other benefits specific to physicians are: expanded access to data, charting and documentation enhancements, decision support, automated prescribing, lower administrative costs, more support and patient satisfaction (Davis and Adams, 2007; Odorisio and Piescik, 1998). Physicians have better access to clinical outcomes via aggregated data from EMRs as to the use and effectiveness of various procedures and medications (Lamont, 2007). Collection of physician input can be streamlined via EMR with dictation, scriptwriting and other applications done using natural language processing integrated with system (Johnson, 2000). Physicians can also enjoy tools that support note creation and access to clinical documents provided by EMR access (Rogoski, 2005). This added information can aid physicians in making decisions based on increased knowledge and trust of the electronic healthcare information (Ellingsen, 2003). In addition, assuming integration with pharmacies, physicians can follow up with prescriptions to identify whether or not

the patient filled the prescription and thereby enable the physician to be informed and close the loop with the patient's diagnosis and treatment (Lamont, 2005). Other benefits such as lower malpractice insurance for physicians with EMR are quantifiable and are based on higher quality of care with lower patient errors (Dunbar, 2002).

Three measures of IT adoption are IT spending, IT strategy and IT management (Dehning and Richardson, 2002). Physicians as owners evaluate and compare IT spending with the revenue or ROI expected from the EMR adoption. In one study a 271 percent increase in clinic revenues from EMR implementation resulted in a 102 percent increase in physician profit (Menachemi and Brooks, 2006). It is important to justify the cost of the EMR adoption, since the direct cost of the EMR is not billed to the patients and therefore the recovery of the cost is indirect (Dunbar, 2002). Physicians see the lack of direct billing of the system as a barrier to adoption. Because of the indirect costs and benefits healthcare IT managers and administrators have difficult decisions when deciding where and how to allocate IT budgets (Sallas *et al.*, 2007). Despite the barriers to adoption, companies invest millions of dollars in EMR to increase productivity, enhance customer satisfaction, improve quality of service and gain new customers (Wang and Alam, 2007; Menachemi and Brooks, 2006).

Competitive advantage

Healthcare is a competitive environment therefore; healthcare organizations must find ways to sustain the competitive advantages IT can create. IT must become a strategic weapon rather than just a productivity-enhancing tool for healthcare organizations to survive (Venkatesh *et al.*, 2007). The resource based view (RBV) of the firm explains how an organization can compete with unique organizational resources that are "valuable, rare, difficult to imitate and non-substitutable by other resources" (Barney, 1991; Smith, 2008). Competitive advantage does not mean that the benefits are forever, but that the advantages are not easily duplicated (Barney, 1991). Firms compete on the basis of unique resources (Ross *et al.*, 1996). If the improvements from technology adoption and innovation are chosen, defined and reengineered wisely, IT provides improvements in business processes and core organizational strategies to assist in achieving a competitive advantage (Glaser, 2007; Venkatesh *et al.*, 2007; Wang and Alam, 2007). Distinct advantages are attained by providing capabilities that aid in delivering high quality care, patient and physician satisfaction, outcome measurement and monitoring and affordable healthcare (Odorisio and Piescik, 1998). Assembly and exploitation of the resources and appropriate combination of the resources gives a healthcare organization competitive advantage (Smith, 2008).

Disadvantages and potential risks of integration of EMR

Despite all the advantages and the platform this strategic alignment can have for competitive advantage, there are disadvantages and potential risks of full implementation of EMR. One of the major challenges with EMR implementation is the ethical dilemma of privacy issues. Despite the fast-moving market demands for EMR systems and integrated EMR via the national healthcare IT infrastructure, the contentious issue of how the more aggressive use of EMR will affect healthcare consumers' privacy is left unanswered (Agarwal *et al.*, 2009, "Health care: taking medical records online"). Healthcare consumers may not be comfortable with the current level of privacy and secure access to EMR. Therefore, they may not share information or give

access to information via fully utilized and integrated personal health records. Without complete and accurate information and healthcare consumers' consent to access and share the information, the national healthcare IT healthcare infrastructure may be inadequate and quality of care may suffer both for the healthcare consumer and for the nation as a whole. Because healthcare consumers have privacy concerns, the subsequent privacy demands could conceivably forestall benefits of networked technology (Bower, 2005).

In addition to these risks, there is another view of the integration of healthcare providers and healthcare consumers' access to that information. Some physicians fear information transparency and are therefore seeking to understand the importance of sharing information and the impact of sharing this information with those who are sometimes competitors (Thielst, 2007). Physicians may be reluctant to tie directly to each other due to barriers related to competition and negotiation in other areas of their business.

Summary

Future research should look at the different competitive environments where EMR operate and the strategic advantages that are attained in this new and evolving environment (Tan and Modrow, 1999). More empirical research in healthcare is necessary to validate findings from EMR adoption and subsequent physician, patient and clinic outcomes and benefits. The conceptual model presented in this paper incorporates previous research and shows that there may be an opportunity for EMR to provide competitive advantage in the healthcare environment. Business process reorganization in healthcare due to the implementation of EMR is another area with gaps in the research. Future research should look at what changes in business processes could increase performance in clinics.

In conclusion, the proposed conceptual model in this paper suggests that the strategic relationships between IT, clinic operations and physicians can provide competitive advantages to healthcare providers. Competitive advantages are attained by optimizing the outcomes for the patients, physicians and clinics via the informed business decisions resulting from the gathering and analysis of information in the EMR system. EMR may provide a platform for the trans-disciplines of healthcare, business and client relations to interact efficiently. The infiltration of EMR in healthcare provides a wealth of information which healthcare providers must be able to analyze and utilize effectively for efficient clinic operations, higher quality of care, lower costs and ultimately competitive advantages that will enable greater financial returns.

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Further reading

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