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An Observation of Healthcare Knowledge Management

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ABSTRACT

Healthcare within the U.S. is reaching a point where the facilities and doctors are collecting large amounts of patient and practice related information. The goal of cost savings is driving investment growth in healthcare technology. The introduction of knowledge management and the ability to leverage IT solutions can provide a means for which the healthcare industry can meet the demand for care that is growing with the increase of population and the gradual retirement of baby boomers. However, the advancements in health informatics along with knowledge management practices currently present challenges in terms of adoption. Therefore, this paper discusses the role of knowledge management and issues of knowledge management implementation in healthcare industry. Knowledge management practices have benefited many industries ranging from banking to retailing. It is widely believed that KM will also benefit the healthcare industry if KM implementation is properly planned and executed. KM may possibly change the way in which hospitals, doctors, and patients interact.

Keywords: Knowledge management, healthcare, health informatics, electronic patient record

INTRODUCTION

In the United States, the rising rate of the population, coupled with the increase in life expectancy, is 11 percent from 2000 to 2012 and 2 percent from 2000 to 2009 (Centers for Disease Control and Prevention, 2012), respectively. The rapid growth of population is placing a mounting demand and burden upon the current healthcare industry. As a result of this growing influx, doctors, hospitals, and insurance companies are required to accommodate more patients for preventive and end of life needs. Additionally, not only are faced with capacity issues, doctors have to consider risk management, where poor information sharing amongst doctors and testing facilities can result in errors in medical diagnosis and treatment (Guptill, 2005). Therefore, medical institutions (e.g., hospitals, rehabilitation facilities, and nursing homes) are currently or will be faced with growing amount of unstructured and unorganized data (Beath, Becerra-Fernandez, Ross, & Short, 2012), impeding the ability of doctors to make well informed decisions, and for medical facilities to make strategic decisions for operations and expansion.

The health care industry is currently at a handicap stage in terms of meeting the growing demand of the general population (Economist, 2012). In order for the healthcare industry to become efficient and effective organizations in meeting demand, it is predictable that they must adopt knowledge management principles. Through the development of information technology (IT), current and future medical data and information can be leveraged to develop knowledge-based

solutions that facilitate collaboration amongst institutions and address the demand for healthcare by improving record management, and the development of more efficient methodologies to diagnose and treat patients in a timely manner.

THE ROLE OF KNOWLEDGE MANAGEMENT

Knowledge includes data, information, and experience. It is the combination of facts, analysis, trainings, and lessons learned that comprise knowledge for an individual. The concept of knowledge management provides individuals and organizations with practices and methodologies that utilize a combination of intellectual capital, business processes, and IT solutions to provide organizations with more efficient and effective operational means. Through the capture, organization, codification (conversion of knowledge), distribution, and utilization of knowledge, companies can leverage and embrace knowledge management practices that enable employees to conduct positive operations. Additionally, the repository of various types of knowledge within an organization allows future generations to learn from past mistakes and to devise innovative solutions for business needs (Awad, 2010).

Generally speaking, knowledge is divided into two distinct categories called explicit and tacit knowledge. Explicit knowledge is information that is easy to capture, structure, and share with individuals. For example, explicit knowledge can be the documentations like hospital policies and procedures and clinic diagnostic methodologies. Alternatively, tacit knowledge is comprised of experience and skills that an individual can acquire overtime and apply to problems. The exposure to events over time can evolve a person's thought process. Tacit knowledge is difficult to capture, structure, and transfer to other individuals (Awad, 2010). Furthermore, Korthari, Hovanec, Hastie, and Sibbald (2011) defines tacit knowledge as the understanding of how and why with regard to a particular subject area. Because of the degree of complexity, objectivity, and subjectivity, tacit knowledge is difficult to capture and transfer without dedicating significant resources to codify the knowledge into an explicit form that can be used by others.

Types of Healthcare Knowledge

From a micro level, knowledge can be further refined. In the healthcare industry, further examination helps to define the various aspects of the healthcare industry and domain that can be taken into consideration with regard to the integration of knowledge management practices. Abidi (2007) has defined eight different types of knowledge within healthcare. However, only three will be expounded on below because of their correlation with the subject matter at hand.

Provider Knowledge

Provider knowledge is also called practitioner knowledge. It is the most obvious type of knowledge that comes to mind. Medical professionals in this capacity possess both explicit and tacit knowledge. For example, doctors are required to know standard medical information that is easily comprehended from reference materials like textbooks (e.g., human anatomy). However, some may consider the most important type of knowledge of providers is of tacit form. Years of

medical practice and experience with numerous patients' help, doctors develop an internal knowledge base of symptoms and facts about patients and medical conditions that are used in addressing needs for preventative maintenance and illnesses.

Patient Knowledge

On the other side of the medical spectrum, it consists of tacit knowledge in patients. This type of information is considered "health status" by Abidi (2001). Patients own complex knowledge in current and past medical conditions that practitioners may not know about. However, such knowledge is vital for practitioners to know, especially when it comes to the diagnoses and prescription treatments for illnesses.

Organizational Knowledge

Medical institutions consist of other knowledge-based resources that are available for patients and doctors to access. This domain of knowledge can be comprised of a variety of knowledge from medical diagnostic systems, text-based materials, and other medical professionals with medical specialties. Moreover, this domain could contain medical land treatment process knowledge that is recommended by an institution or medical society (e.g., American Medical Association).

HEALTHCARE KNOWLEDGE MANAGEMENT IMPLEMENTATION

Knowledge management practices have been adopted in many businesses. However, the healthcare industries have been slow to adopt such principles and concepts (Eysenbach & Jadad, 2001). Companies that seek to become knowledge centric have been integrating knowledge management concepts with IT and business practices. Since the development and commercialization of the Internet during the 1990s, IT has played a greater role to facilitate knowledge management within organizations (Beath et al., 2012). IT is a tool that leverages technology and information to increase the productivity of processes. Since being defined in the 1960s, IT systems have gone from be used as a tool to manage data and fulfill management reporting needs, to provide mechanisms for strategic management decisions, and promote collaboration amongst internal and external entities (Petter, DeLone, & McLean, 2012).

The integration of healthcare and IT is commonly referred to as health informatics. Health informatics is becoming a popular topic among the healthcare industry (Berry & Mirabito, 2010). Similar to the concept of knowledge management, both do not involve business process engineering. Rather, the purpose behind health informatics is to automate existing processes to increase efficiencies. Healthcare informatics has a purpose to provide growths in patient care and service (Yasnoff, O'Carrol, Koo, Linkins, & Kilbourne, 2000).

HEALTHCARE INFORMATION SYSTEMS

As a result of the health informatics, some knowledge management IT solutions have been implemented within the healthcare industry, similar to those of the general business world. For example, medical institutions have been implementing content management tools such as medical knowledge base repositories and lessons learned. In addition, web-based learning management systems have been deployed consisting of online classes and educational videos to further the education of medical professionals. Finally, a varying degree of unified communication systems have been utilized to promote the transference of knowledge via socialization and collaboration techniques facilitated by text-based and video chat (Dixon, 2010; Guptill, 2005; Zhou, Kanter, Wang, & Garrido, 2010).

In recent years, a popular type of healthcare information system is being implemented by large hospitals. Electronic medical record (EMR) systems and personal healthcare records (PHR) have been developed and deployed, transforming the customary patient paper-based record system. Patient's diagnostic data and treatment information have been converted into an electronic format that can be accessed by medical staff within a hospital and other partners for the purposes of assessing a variety of test results and providing treatments. The types of data that can be fed into and stored in an EMR or a PHR are extensive. When taken in their aggregate, these data can be analyzed and organized into meaningful information. Both EMR and PHR can be shared among the various health care providers offering a more holistic patient profile than can the individual pieces of data. Typical examples of the data feeding into a PHR are lab results, medication history, allergies, chronic diseases, imaging reports, healthcare claims information, hospitalizations, etc. (Agarwal, Gao, DesRoches, & Jha, 2010; Cantrill, 2010).

In 2004, President George W. Bush instituted a new government office, the Office of the National Coordinator for Health Information Technology to support the development of healthcare IT within the United States. The purpose behind such an endeavor is to attempt to reduce healthcare costs and errors from information gathering. The Office of NCHIT is to increase the ease of use in which medical information can be transferred to patients and other medical providers (Office of the National Coordinator for Health Information Technology [ONC], 2012).

As noted by Gunter and Terry (2005), the healthcare system within the United States cannot comply with a universal concept as defined by the Office of the NCHIT because of the disparities that currently exist among healthcare providers. Without the standardization of healthcare practices such as terms used, reporting format, and system processes, the ability for IT systems to work seamlessly together with multiple internal and external systems will fail. The availability or flow of information may become a bottleneck of the deployment of a healthcare system (Gunter & Terry, 2005). Medical facilities like hospitals are independently owned and operated. They must abide by some medical terms and regulations such as HIPAA are dictated by government agencies (Huang & Liu, 2011). However, there appears to be no degree of urgency with regards to standardizing the healthcare industry. The Health Information Technology Standards Panel is working on the standards of the healthcare industry. Furthermore, without any mandate by the U.S. government, a dominate industry architecture will never be

developed. Hospitals will be required to continue to bear the burden of the lack of advancement in collaborative information sharing (Chen, 2009).

HEALTHCARE DECISION SYSTEMS

The advents of electronic medical record systems are only address one aspect of the healthcare IT and knowledge management practices being implemented in the medical community today. Currently, institutions that have established electronic medical record systems have been further refining their knowledge by codifying and transferring explicit and tacit knowledge like medical practices, processes, and experience into health care decision support systems (Hazlehurst, Frost, Sittig, & Stevens, 2005; Peleg, Keren & Denekamp, 2008).

While healthcare decision support systems can be developed to meet various needs. Abidi (2001) defines the overall intention behind the implementation of clinical support systems is to increase the efficiency of operations by leveraging observational knowledge. By leveraging observational knowledge, practitioners amongst other staff can make strategic decisions with regard to the treatment of a patient, forecasting diseases, and addressing operational business concerns like healthcare cost through data mining techniques (Abidi, 2001; Peleg et al., 2008).

Recently, insurance companies and federal and state funded programs within the United States like MassHealth have started to implement a degree of decision support systems. For example, MassHealth utilizes a pharmacy benefit management programs called MedMetrics (created by the University of Massachusetts Medical School). UMass Medical School is a third party used by MassHealth to review prescriptions issued to subscribers by practitioners to make sure that their subscribers were prescribed the appropriate cost-effective medication for their respective medical condition. If a prescription falls outside of the organization's specified treatment, subscribers are required to submit a prior authorization form that gathers specific medical details and they either are denied or approved coverage based upon review (MedMetrics, n.d.).

The development of a healthcare decision support system of this nature has been successful because the organization has developed a structured repository of knowledge pertaining to drug classification systems, usage, and other information like reactive relationships from pharmacies and federal institutions. Additionally, the organization is able to develop a knowledge base of prescription usage based on drug for purpose cost and audit analysis to its customers. However, based on usage of such a program, it has been observed that the development of such a system has neglected patients that required expensive drugs due to other unsuccessful treatments or other criteria that are built into the logic reasoning of the system. Therefore, it is plausible that the codification process in developing the logic reasoning requires continuous modification by knowledge experts. As information and data is continuously submitted by medical institutions for coverage evaluation, the healthcare decision support systems should be constantly updated with appropriate logic reasoning.

CODIFICATION OF HEALTHCARE KNOWLEDGE

The implementation of knowledge management practices and IT-related systems in healthcare industry is unlike other KM practices in other businesses (Nicolini, Powel, Conville, Martinez-Solano, 2008). However, the methods in which knowledge is codified, meaning the organization and conversion of tacit knowledge into a usable format differs according to the type of solution that is being sought. For example, to develop knowledge bases that facilitate experience-based sharing and medical cases, Abidi (2007) suggests existing knowledge and information must be modeled in order to develop a structure for which a knowledge base can be developed. Some suggests classifications are medical stages of specialty versus acute versus chronic illness (Abidi, 2007; Wilcox & Hripcsak, 2003).

In order to codify and transfer this type of clinical knowledge, Abidi (2007) leverages practices that are used in other industries that leverage knowledge management. For example, the elicitation of tacit knowledge can be derived from knowledge experts via interviews. Alternatively, knowledge developers can develop a model and define the system requirements based on evaluation of clinical practices to understand common medical elements and relationships. Furthermore, in order to develop decision-based support systems, knowledge developers require a clear understanding of both explicit and tacit knowledge in terms of the relationships and outcomes between medical conditions and treatments. Therefore, existing logical decision-based rules need to be developed following clinical procedures, practices, and the knowledge expert's experiences (Abidi, 2007; Schulz, Romacker, & Hahn, 1998).

Conversely, the current implementation of most electronic medical record systems contains unstructured and redundant information. The decision-based system with these types of information becomes difficult to leverage electronic medical record information. Juarez et al. (2009) suggests that rather than modeling logic decisions and processes, data and decision models should be used to develop knowledge medical standards through the use of knowledge acquisition tools to aid in the extraction, conversion, and definition of tacit knowledge for use in the creation of lessons learned knowledge bases (Juarez et al., 2009).

BARRIERS TO THE ADOPTION AND ACCEPTANCE

As with any IT project, the implementation of knowledge management healthcare IT systems requires the support of top management and a champion. Champion is someone who understands existing business processes, resources and contacts within organization. Champion believes the KM project will bring benefits to the organization and is willing to secure the organizational resources for a new KM system from inception to deployment (Eysenbach & Jadad, 2001; Jones, Herschel, & Moesel, 2003). Furthermore, the limitations of an institution's IT infrastructure can limit the scope of knowledge management system implementations. However, IT should act in a supportive and facilitator role while knowledge management initiatives are filed by the business side of operation (Nicoline et al., 2008).

The greatest barrier to the success of any knowledge management solution is the organizations culture (Korthari et al., 2011). This barrier is comprised of both organizational perspective and

individual perspective. For example, if the management of a hospital or medical facility deploys knowledge management practices and systems without the consideration of its users, the overall success of the initiative can be impeded severely. Therefore, a champion must be present along with management support to engage user involvement in the knowledge management system development life cycle. Building a KM system is like the formation of community of best practices (Ardichvili, Maurer, Li, Wentling, & Stuedemann, 2006). With regard to IT-based solutions, knowledge experts and workers should be engaged for system requirements and knowledge elicitation to make sure the system is not only developed accordingly with regard to its intended purpose, but to educate, familiarize, and promote the importance of such practices and tools (Eysenbach & Jadad, 2001).

The composition of an institution's culture consists of doctors, nurses and other administrative staff. Knowledge experts exercising knowledge sharing may have conflict with individual mindsets (Ardichvili, et al., 2006; Connelly & Kelloway, 2003). Eysenbach and Jadad (2001) elaborated on this topic and reached the conclusion that some practitioners do not necessarily believe in the sharing of knowledge may present a challenge to the success of KM practices. Customary medical practices have relied upon practitioners as knowledge experts providing diagnoses and treatments. With little documentation or information for reasoning, practitioners are placed in a position to defend practices and reasoning (Eysenbach & Jadad, 2001). Therefore, the creation of decision-based systems amongst other IT-based solutions may encounter hurdles depending on the receptive nature of individual. Organizational culture in operation is strongly tied to long standing medical practices and methodologies.

IMPACT OF KNOWLEDGE MANAGEMENT

The implementation of knowledge management practices and systems within the healthcare industry can become a success or failure. As with any project, just because a system has been put in place utilizing the appropriate methodologies and practices, does not mean that it will become successful in terms of adoption and utilization. Unfortunately, this is an unavoidable risk. However, the underlying principles of knowledge management implementation are directed at facilitating collaboration, increasing operational efficiencies, protecting company's intellectual capital, and avoiding high rate of attrition.

While the direct impact upon healthcare institutions is difficult to measure (Jha et al., 2009). The Office of the National Coordinator for Health and Information Technology provides a few elements for which performance metrics can be defined. Based on the mission of the Office the following elements align with those benefits of knowledge management defined by Guptill (2005): improvement in quality of care and service, reduction in healthcare costs, and the improvement in the coordination of information amongst facilities, institutions, and personnel within healthcare industry (ONC, 2012).

The Commonwealth Fund Commission (2011) presents an interesting summary of the U. S. healthcare systems from 2006 to 2009. The metrics mentioned previously use 42 elements focusing on health lives, quality of healthcare, access to healthcare, and hospital efficiency for the Commission's 2011 scorecard. Based on results from these key performance indicators, the

Commission concluded that the overall performance of the U. S. healthcare system has declined three percent during the three-year time period. In the same period, the overall quality of health care declined; but the average spending on health per capital increased 15 percent. Besides, the Commission found that the adoption of electronic medical record systems increased among primary care physicians to 46 percent in 2009, which is lower than the European counterparts who are at or above 60 percent.

Interestingly, the statistics presented by the CFC support the results of a journal article published in *The New England Journal of Medicine* in 2009. It reported that only 7.6 percent of U. S. hospitals have a basic electronic management system implementation in place (Jha et al., 2009). Further, the survey assessment affirms the barriers of entry for knowledge management systems for the healthcare industry. Specifically, hospitals present a significant burden to implement KMS at this time (Jha et al., 2009).

CONCLUSION

Overall, the implementation of knowledge management practices and systems is topic of great interest amongst the healthcare community and the business world. There are numerous articles being published every year on these KM issues in healthcare. However, there appears to be a lack of detailed analysis on actual implementation and lessons learned with existing IT-based knowledge management implementations in the healthcare industry. A majority of the studies and other resources about knowledge management, healthcare, and informatics appear to focus on the theories and practices. While the development and creation of electronic medical record systems appear to be of interest now. It lays the foundation of a standard healthcare information system. Research of this subject matter provides interesting insights into the possibilities of KM practices in future healthcare systems.

Common issue of information overload has been reported in the healthcare community (Nicolini et al, 2008). This is understandable considering the differentiation and the vast nature of the medical profession. It appears that health information solutions like electronic medical record management systems are become much popular with hospitals. They have capital and resources to afford such undertaking. For example, Partners Healthcare Incorporated manages some of the top rated hospitals of the east cost of the United States, such as Massachusetts General Hospital and Brigham and Women's Hospital. In 1994, Partners Healthcare initiated an electronic management records system via InterSystems Ensemble. InterSystems, a web-based solution, provided Partners Healthcare with the ability to integrate multiple electronic medical record systems and existing data repositories that contained patient information. Overall, this venture resulted in hospital expenditure savings and a reduction in prescribed medication drug reactions (InterSystems, 2012). However, the development of electronic medical record IT solutions appears to be a constantly evolving platform. During May 2012, Partners Healthcare announced a new ten year health informatics venture with EPIC to advance the organization's IT infrastructure and provide not only doctors, but also patients with greater access to medical record information like examination notes, lab results, financials, and other medical knowledge from best practices and knowledge-based resources (Partners Media Center, 2011).

It is foreseeable that health care industry is into adopting knowledge management practices and IT-based solutions in an effort to maintain operational efficiencies and to operate collaboratively to share information and knowledge with partners and patients. The implementation of a well-designed knowledge management system is aimed to alleviate the risks associated with medical diagnoses and treatments in the future. It is quite possible that the customary healthcare KMS will allow people with medical needs to access professional healthcare knowledge and advice virtually. Patients are able to see a doctor or a nurse practitioner remotely. They no longer need to travel to see a doctor. Since the advent of the Internet, there appears to be a shift in the medical knowledge with regards to where people seek further insight into various medical questions and disorders. Online knowledge base repositories like WebMD have been extensively developed to provide visitors with explicit knowledge that is easy to comprehend. Educational videos help to transfer tacit knowledge into a format that is digestible. The further advancements of cloud-based medical information systems and knowledge-based repositories will no doubt lead patients to take a greater participation in their healthcare decision as medical knowledge becomes structured and available.

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