

A Framework Linking Knowledge Management Practices and Healthcare Delivery Performance

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Abstract: Being a knowledge driven process, healthcare delivery provides opportunity to incorporate knowledge management practices to improve processes. But it has also been noted that knowledge management (KM) is systematically more complex in healthcare and minimal research exist to guide academic and organizational stakeholders. The purpose of this paper is to investigate the application and impact of knowledge management practices in healthcare delivery. The paper is primarily based on a literature review of the healthcare knowledge management and associated information sciences research streams. The fundamental research questions are: “what and how do the various knowledge management practices affect the performance of healthcare delivery?” and “what are the contingent and contextual factors that needs to be considered when exploring the relationship between knowledge management practices and performance of healthcare delivery?”. The paper is conceptual in its nature and aims to propose a contingency based framework to drive further empirical research. We first discuss facets of performance in healthcare delivery but thereafter focus on the technical and interpersonal care aspects of healthcare delivery. We investigate KM practices in the areas of (i) knowledge elicitation, acquisition and sharing, (ii) knowledge application for clinical decision support, and (iii) capturing and sharing patient information. In our paper we explore how the different KM practices affect the performance of healthcare delivery through technical and interpersonal care. Thereafter we explore the factors of physician characteristic, ailment characteristics and organization characteristics, on which the conceptual framework will be contingent on. From an academic perspective our paper identifies some key KM practices and explores their linkages with technical and interpersonal care, while from a practical point of view it provides implications for administrators and practitioners in healthcare delivery on the management of contingency factors so that the KM practices can be properly implemented.

Keywords: healthcare knowledge management; healthcare delivery performance; electronic medical records; clinical decision support; evidence based medicine

1. Introduction

Healthcare delivery is a knowledge driven process and hence knowledge management and knowledge management capacity provides an opportunity for improvement in process performance (Nilakanta et al., 2009). Recent reviews on knowledge management in the healthcare industry show important insights into the state of present research (Nicolini et al., 2008, Sheffield, 2008). Sheffield (2008) states that knowledge management is systemically more complex in healthcare because the three domain of knowledge creation, knowledge normalization and knowledge application correspond to three knowledge management perspectives i.e., personal values, social norms and objective facts, respectively, which have inherent tension between and within them. Nicolini et al. (2008) has noted that knowledge management research over the years have focused on three overarching themes: “the nature of knowledge in the healthcare sector, the type of KM tools and initiatives that are suitable for the healthcare sector, and the barriers and enablers to adoption of KM practices”.

Recent research nonetheless, Dwivedi *et al.* (2005) has noted that knowledge management as a paradigm in healthcare has been quite new and there exists minimal research to “guide academic and organizational stakeholders”. The purpose of this paper as such is to develop and describe a model to provide an explanation of the application and impact of knowledge management practices in healthcare delivery. First it provides a background on aspects of performance in healthcare delivery. Then a conceptual framework on the application of knowledge management practices and their impact on healthcare delivery, along with the contingent factors that affects these relationships, are developed and discussed. Finally, conclusions are drawn and further research recommendations are made.

2. The context - healthcare delivery and performance

Delivery of healthcare is a complex endeavour (Sheffield, 2008). The primary organizations for healthcare delivery are the *healthcare providers* although inter-organizational relationships with other players provide a foundation. Though similar to service organizations, healthcare delivery organizations differ from other organizations in many aspects. Shortell and Kaluzny (2000) state some

important differences between healthcare delivery organizations and other industrial organizations such as work is “variable and complex” and can be also of an emergency or non-deferrable nature and there is very little tolerance for “ambiguity or error”. Healthcare delivery also presents a very a unique situation exists where the primary loyalty of the professionals belong to their profession rather than to the organization (Shortell and Kaluzny, 2000).

Furthermore, healthcare delivery is moving away from a physician-patient relationship to a customer-company relationship, and at the same time the traditional single physician-patient relationship is moving towards a situation where the healthcare is delivered by a team of healthcare professionals wherein each specialize in a single aspect of healthcare (Bose, 2003, Burns and Wharton School Colleagues, 2002).

Performance in organizations is multidimensional, and can be understood across functional lines such as financial, human resources, organizational learning etc. Performance in healthcare delivery can be studied along the different domain of activities, and across the dimensions of effectiveness, accessibility and efficiency (Alhashem et al., 2011, Li and Benton, 1996).

As the focus of this paper is to explore how knowledge management practices affect healthcare delivery, we have to finalize a framework which provides the opportunity for most plausible way to study the impact of KM practices on healthcare delivery. Hence we decided to look into the measures of effectiveness and quality in clinical and patient care in the context of healthcare delivery.

Quality of clinical and patient care can be viewed both in terms of outcome and the degree to which the need and expectation of the patient has been meet in terms of technical and interpersonal care (Donabedian, 1988, Campbell et al., 2000, Esch et al., 2008, Dagger et al., 2007).

2.1 Evidence based medicine

Evidence-based medicine is a measure of *effectiveness in the process of technical care* in healthcare delivery (Campbell et al., 2000). Evidence-based medicine is the paradigm in which the “conscientious, explicit, and judicious use of current best evidence is used in making decisions about the care of individual patients” (Sackett et al., 1996). The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence (based on all valid and relevant information) from systematic research (Hicks, 1997, Sackett et al., 1996, Abalos et al., 2005).

Eddy (2005) has pointed out there are two different approaches to practicing evidence-based medicine, *implementing evidence-based guidelines* and *adopting an evidence-based individual decision making process*. He notes that Integration of these approaches combination moves medical practices toward evidence faster, more consistently, and more efficiently than evidence-based individual decision making alone.

The extent to which physicians practice evidence-based medicine, in terms of both implementing evidence-based guidelines and adopting an evidence-based individual decision making process, is an determinant of healthcare delivery performance.

2.2 Interpersonal care

Interpersonal care is the social and psychological interactions that happens between the patient and the physician or other care givers (Campbell et al., 2000). Several researchers have already pointed out that the quality of interpersonal care is one of the most important constituent in patient satisfaction and their perception of service quality (Dagger et al., 2007, Gill and White, 2009, Li and Benton, 1996, Naidu, 2009). Effectives in the context of interpersonal care is whether the interactions were was efficacious and appropriate (Flood et al., 2000).

3. Conceptual model

3.1 Social practices of knowledge acquisition and sharing

Many researchers (Davenport and Glaser, 2002, Nicolini et al., 2008, Gray and de Lusignan, 1999, Heathfield and Louw, 1999) state that healthcare has reached a stage wherein individual healthcare

professionals can no longer keep track of the vast amount of scientific knowledge that is relevant to their clinical practice. Overwhelming but nonetheless nature of knowledge in healthcare is such that it is distributed and fragmented across organizational and professional boundaries (Meijboom et al., 2004, Nicolini et al., 2008, Gray and de Lusignan, 1999, Heathfield and Louw, 1999). Gary and de Lusignan (2004) state that, "healthcare professionals face a paradox; they are overwhelmed with information but cannot find a particular piece of information when and where they need it".

Healthcare delivery in itself is a setting where different professional groups having differing "rules, job representations, behaviors and value coverage" engage in a collaborative process, with both "explicit and tacit knowledge aspects", to achieve outcomes in terms of access, quality and cost (Paul, 2006, Tagliaventi and Mattarelli, 2006, Nicolini et al., 2008).

Networks amongst healthcare professionals are nothing new. They have existed and have always played an important part in healthcare delivery, but the formalization of these networks in recognition of their potential for knowledge sharing is new (Conner, 2001). Managed clinical networks provide the opportunity for "working in a coordinated manner, unconstrained by existing professional and organisational boundaries" to improve quality of care (Edwards, 2002, Thomas, 2003).

Researchers (Lathlean and Le May, 2002, Gabbay and Le May, 2004) have found that communities of practice (CoPs) provide a new pathway to sharing clinical evidence and new knowledge between the various different specialized healthcare professionals (physicians, nurses, technicians, etc) that are members. CoPs thus provide a mechanism for the different professional groups that exist within a healthcare organization, to leverage on their tacit knowledge base. The scope of CoPs are now being broadened to study on how knowledge and information is shared, used and valued in decision making and action planning between agencies, professional groups and between these and consumers (Lathlean and Le May, 2002). Gabbay *et al.* (2003) report that some of the emergent themes after their study of multi-organizational CoPs to identify knowledge-related behavior, was that certain kinds of knowledge were deemed to be privileged and accepted, and that the CoP members individually and collectively transformed and internalized new knowledge that became available to them.

Several researchers have noted that the transfer of knowledge among healthcare practitioners (physicians, nurses, technicians) is dependent on professional networks and communities of practice. Hence these should be leveraged by healthcare delivery organizations as an important means of diffusing medical evidence and 'best practices' across organizational boundaries (Brice and Gray, 2003, Gabbay et al., 2003, Tagliaventi and Mattarelli, 2006, Lathlean and Le May, 2002, Addicott et al., 2006). As such, CoPs and networks have implications for evidence-based medicine. Hence, it is proposed that:

P1: Involvement in social learning practices will have a positive effect on the practice of evidence-based medicine.

3.2 Knowledge elicitation and application for clinical decision support

Distributed, explicit or tacit, knowledge form the basis for decisions in healthcare (Nicolini et al., 2008). As such the management of knowledge is paramount in the context of a healthcare delivery organization. Healthcare professions face a dilemma as there has been an revolutionary increase in clinical knowledge but still healthcare processes have not been able to utilize and incorporate these available knowledge when and where it is required (Nicolini et al., 2008, Gray and de Lusignan, 1999). Creating electronic repositories to facilitate the management of both tacit and explicit knowledge of healthcare professionals in the form of articles, guidelines, clinical protocols etc., have been referred to as paramount to adoption of knowledge management in healthcare delivery (Nicolini et al., 2008, Wales, 2005, Plaice and Kitch, 2003).

The nature of knowledge has to be also taken into consideration while thinking about adoption of knowledge mined from knowledge repositories. Particularly as research has shown that some kinds of knowledge (for example knowledge from local and tacit sources) have better adaptability (Gabbay and Le May, 2004, Clarke and Wilcockson, 2002).

Clinical decision support systems (CDSS) are systems that provide healthcare professionals with "patient-specific assessments or recommendations to aid clinical decision making" (Kawamoto et al., 2005). CDSS aids in clinical decision making through analysis of patient-specific information in

“comparison with an expert knowledge base” (Bose, 2003). CDSS can provide healthcare professionals with such services as access to clinical guidelines, computer assisted diagnosis, drug dosing and prescription and electronic reminders (Nicolini et al., 2008). Hence effective data mining through CDSS is one of the important tools to acquire and operationalize healthcare knowledge (Abidi et al., 2005).

CDSS would hence have to provide a synergy between knowledge procurement (data mining) and utilization of the knowledge in decision making both through its functional and architectural specifications (Abidi, 2001). Kawamoto *et al.* (2005) conclude after their study of identifying features of clinical decision support systems critical for improving clinical practice, that features very important for healthcare professionals to adopt and use are: provide decision support automatically as part of clinician workflow, deliver decision support at the time and location of decision making, provide actionable recommendations, and use a computer to generate the decision support.

CDSS does not necessarily stop there, CDSS usage provide data for operational and administrative decisions that are stored in data warehouses and can be accessed later for utilization review, cost evaluation and performance evaluation.

Knowledge Management practices in particular CDSS can facilitate the practice of evidence based medicine (Jadad et al., 2000, Bose, 2003). In combination with electronic repositories CDSS can provide the framework to achieve evidence based healthcare (Wales, 2005). These practices in itself will not be enough and will have ineffective unless they are included in the clinical workflow (Kawamoto et al., 2005). Frize *et al.* (2005) has noted that though the transition from using traditional decision practices to CDDS is a complex and arduous process, the transition did allow the physicians to better predict certain outcomes. Patkar *et al.* (2006) after their study on evaluation of CDDS for the triple assessment (TA) in breast cancer care, has suggested that use of CDDS may result in improved compliance with evidence-based practice guidelines. Hence, it is proposed that:

P2: The adoption and use of clinical decision support systems will be positively related to the practice of evidence-based medicine.

3.3 Capturing and sharing patient information

The traditional single physician-patient relationship is moving towards a situation where the healthcare is delivered by a team of healthcare professionals wherein each specialize in a single aspect of healthcare (Bose, 2003). Such an environment necessitates the capturing and sharing of clinical data pertaining to a patient between the different care providers.

Electronic medical records are *medical records* of a patient that is stored and retrieved in digital/electronic format. The aim of medical records is to act as a repository of the physician's observation and analysis of the patient (Hersh, 1995). Medical records normally contain historical information available about the patient, information from physical examination, results from tests and procedures performed on the patient. As such electronic medical records (EMR) can be defined as “digitally stored healthcare information about an individual's lifetime with the purpose of supporting continuity of care, education and research, and ensuring confidentiality at all times” (Iakovidis, 1998). Data may be inserted into the EMR directly by the patient, physician or any other provider or by a series of different techniques (Bose, 2003).

Ludwick and Doucette (2009) in their extensive review of literature on adoption of EMRs across seven western economies have noted that physicians, still have significant doubt regarding the impact of EMRs on “privacy, patient safety, provider/patient relations, staff anxiety, time factors, quality of care, finances, efficiency, and liability”. Another significant factor which inhibits the adoption of EMRs across is the lack of standardization which creates barriers for storing of EMRs in a central location and then sharing it across different boundaries (Ludwick and Doucette, 2009, Wickramasinghe and Geisler, 2007).

Nowinski *et al.* (2007) have noted that the implementation and use of EMRs has the possibility to impact the healthcare delivery process in multiple ways, for example, the way the physicians and nurses interact with the patient, waiting time in admission and discharge processes. Their analysis shows that patient satisfaction in the process decreases the longer EMRs has been implemented. Margalit et al. (2006) conducted an observational study in Israel to ascertain the influence of EMRs on

physician-patient communication and deduced that physician use of computers can negatively affect “patient-centered practice by diminishing dialogue particularly in the psychosocial and emotional realm” (p. 140). A similar study carried out by McGrath *et al.* (2007) to ascertain the influence of EMRs on nonverbal communication between the patient and the physician found out that it cannot be clearly said whether the physicians use of EMRs had any negative impact on the patient-physician relationship, though it does create ‘breakpoints’ during conversations. Hence, it is proposed that:

P3: The adoption and use of EMRs will be negatively related to the effectiveness of Interpersonal care.

3.4 Contingency factors

Contingency theory states that there exist important situational influences that distinguish between contexts and provides alternative to universal principles of management while studying a phenomenon (Zeithaml *et al.*, 1988, Ambrose, 2000). An aspect of contingency as identified by Zeithaml is the identification and grouping of contingency variables (Zeithaml *et al.*, 1988). Ambrose (2000) provides an important contribution on contingency variables to the aspects of clinical decision making.

Ghosh and Scott (2007) have noted that the effectiveness of knowledge management systems in healthcare delivery, as measured by impact on both organizational-level and patient-care benefits, is dependent on the levels of KM infrastructure (structure, technology) and KM process (acquisition, conversion, application, protection) capability. Similar knowledge management model in a healthcare delivery context, put forward by Orzano *et al.* (2008) states that the critical KM processes (finding, sharing and developing knowledge) lead to better decision-making and organization learning which in turn lead to organization performance in terms of quality, satisfaction and productivity. Further inherent to the model is the important role of the various factors that act as enablers for KM processes (Lee and Choi, 2003).

We identify three primary contingency factors that affect the impact of KM practices on healthcare delivery performance – physician, ailment, and organizational characteristics.

3.4.1 Physician characteristics

A Physician’s technical skills, training, experience will affect the clinical problem solving paradigm adopted (Ambrose, 2000). A physician’s previous experience and training, which can typically take a mentor-apprentice route, will have an effect on their usage of KM practices (Liebowitz, 2007). In similar stead Ryu *et al.* (2003) state that a physician’s subjective norms have an effect on their knowledge sharing behaviour.

3.4.2 Ailment characteristics

Ailments, the patients present themselves with; can be characterized in terms of *complexity of the symptoms* and *urgency of treatment* (Ambrose, 2000). Combinations of these factors lead the healthcare delivery organization making choices towards adoption of KM tools and putting their focus on specific performance measures.

3.4.3 Organizational characteristics

Implementation of KM in healthcare delivery organizations is dependent on leadership, culture, HRM practices and IT infrastructure and skills that promote KM (Sensky, 2002, Bali *et al.*, 2005). Similarly, organizations operating procedures and policies also impact the use of KM tools and also put the focus of the desired performance. For example, Addicott *et al.* (2006) have found that excessive legitimization and formalization of networks create disruptions in knowledge sharing. Similarly singular focus on CoPs and social networks can lead to the “non-spread” of knowledge these provide, given strong social and cognitive boundaries (Ferlie *et al.*, 2005).

4. Research approach to test the conceptual model

For testing the conceptual model presented in the previous section, hermeneutic research is needed to develop “well grounded, rich descriptions and explanations of processes in identifiable local contexts” (Miles and Huberman, 1994, 1). Furthermore qualitative research is also preferable as it can

lead to generation of new knowledge from improved understanding of the context and existing body of knowledge (Eisenhardt, 1989, Badir et al., 2009).

As such we posit in-depth case studies of healthcare delivery organizations which will permit the researchers to investigate in detail the interactions between the phenomenon under study and the contextual factors (Yin, 2003). Case study research would hence serve the following purposes:

- Help validate and modify the constructs with clear conceptual definitions and the relationships between these constructs
- Help validate and modify the contextual organizational and other attributes, and uncover their influence in the specific context.

The researchers have identified a few hospitals in Bangkok, Thailand for carrying out the case studies.

5. Conclusions

This paper has sought to develop a framework to understand the impact of KM practices in healthcare delivery, especially on evidence based medicine and interpersonal care. We had also tried to explore the contingencies on which the relationships may be contingent on.

The adoption of EMRs can impact the efficiency of healthcare delivery in terms of capturing and sharing patient data among the different care givers, but it can negatively impact the physician-patient relationship and subsequently the interpersonal care that the patient receives. The adoption of CDSS and involvement in social learning practices, such as networks and CoPs, can have an impact on the adoption of evidence-based guidelines, and evidence based decision making process by physicians. This though would be contingent on whether the physicians have had previous experience in these practices or whether the healthcare delivery organizations provide supporting policies for these practices.

Administrators in healthcare delivery organizations have to be mindful that adoption of KM practices would be dependent on leadership, IT infrastructure and supporting policies in HRM. As physicians within healthcare delivery organizations normally gain experience through a mentor-apprentice route, an organizational culture that promotes and rewards such behaviour would be beneficial. But care should be taken to not excessively formalize social learning practices, because it may lead to disruptions in knowledge sharing between physicians.

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