From Evidence-Based to Knowledge-Based Healthcare: A Task-Based Knowledge Management Approach

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Abstract The healthcare is a knowledge-based profession where ideally decisions are based on formal evidence. But the challenges faced by healthcare decision makers are to apply these generic and population level evidence to the specific situation of an individual patient. In this paper we argue for a knowledge-based approach to medical decision-making. Such an approach is grounded in general population level interventions, based on the evidence that informs and is specialized to the specific context of a particular patient. We propose task-based knowledge management (TbKM) as a theoretical construct to implement the knowledge-based approach to medical decision-making.

1 Introduction

Success of a society is always linked to its health and wellbeing. Health and health systems are fundamentally important from both economic and social perspectives as a healthy population can underpin strong economic growth and community wellbeing and prosperity (Suhrcke et al. 2006). Development of an efficient healthcare system presents a prime concern for every society since there are considerable challenges and issues to deal with. Many of those challenges are concerned with responding to the increasing complications of the healthcare environment such as growing cases of chronic diseases or the shortage of vital skills in the industry.

Healthcare is widely recognized as a knowledge intensive community that relies on knowledge creation and sharing and within the last 15 years evidence-based medicine (EBM) has become an essential part of healthcare delivery (Haynes 2006). In EBM, medical decisions heavily rely on the results attained from the gold standard of medical studies known as double-blind randomized controlled trials or RCT (Elstein

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2004; Ncayiyana 2007). The main goal of RCT is to determine the efficacy of a specific medical intervention on a cohort who represents a broader population (Evans 2003). EBM also relies on monitoring new interventions that are universally applied to the population at large (Caulfield 2007). This cycle of RCTs and the extensive method of monitoring of EBM contribute to the generation of new knowledge about the treatment of a particular condition and importantly the limitations of a specific intervention.

Guyatt et al. (2004) argue that the limitations of EBM arises from the fact that many important medical decisions need to remain sensitive to patients' specific conditions, values and preferences. Sackett et al. (1996) believe that without careful consideration of patients' contexts, the risk of evidence–based medical decisions risk become oppressive since even excellent evidence may be inapplicable to or inappropriate for an individual patient. Woolf et al. (2005) and Corrao et al. (2008) concur with Sackett et al. (1996) and argue that the quality of clinical decisions can be improved through the development of effective knowledge management program, leading to a more effective healthcare system.

In this paper we argue for a knowledge-based approach to medical decision-making. Such an approach is grounded in EBM as a general, population level intervention that informs and is specialized to the specific situation of an individual patient. We propose task-based knowledge management (TbKM) as a theoretical construct to implement the knowledge-based approach to medical decision-making.

This study is organized as follow. In the next section the significance of healthcare systems and the challenges they face are discussed. This section sheds more light on the context and state of healthcare problems in Australia by looking into Australia healthcare system and the nature of this industry. The following section is concerned with how knowledge management addresses those issues followed by the penultimate section where we explore what solutions task-based knowledge management model can offer. We conclude with suggestions on further areas of investigation.

2 Healthcare System and its Challenges

Health systems generally face enormous challenges that are mainly concerned with the development and provision of a variety of services to meet their ever increasing consumer demand. Meeting these challenges will ensure that healthcare systems remain a reliable and effective driving force for social and economic development (Bloom et al. 2004). Therefore, it is imperative for healthcare systems to develop a mix of complex services that effectively respond to their stakeholders' requirements. On the other hand, the development of these complex services inevitably relies on scarce resources.

Healthcare systems usually have to deal with limited financial and human resources. These limitations can widen the gap between health consumer demands and the supply of the health services. As Lindholm et al. (2001) argue this gap can have unfavorable impacts on the quality of the healthcare services in long term may even have severe consequences on economic growth and social development. For example,

the healthcare system is one of the largest and most complex industry sectors in Australia and in order to maintain its health outcomes, the Australian healthcare system has to carefully monitor and deal with two major sets of challenges that can affect its performance adversely (AHMAC 2008). The first set is mostly concerned with issues around the rapid growth of consumer demands (Armstrong et al. 2007). Although these are radical challenges, its discussion is beyond the scope of this article. The second set of challenges resides in the nature of the industry as a knowledge-based industry sector. In a healthcare system there is a broad range of knowledge-intensive communities, such as physicians, specialists, nurses, and patients who make the system dependent on knowledge and knowledge becomes a driver across the industry (Fox et al. 2005; Ghosh and Scott 2007).

Because of the high level of dependency on knowledge, the industry strive to find effective ways of dealing with the increasing necessity to capture, manage and apply the health related information and knowledge (National EHealth Strategy 2007). In fact the major players of the industry have come to the realization that properly addressing the knowledge challenges can pave the way to implement a reliable and sustained healthcare system that supports all aspects of healthcare from planning, to management and deliverying services.

To achieve this goal, it is crucial to maximize the efficacy and efficiency of the healthcare system. This can be achieved by deploying the knowledge residing with its workforce, as developing extensive information bases to support effective decisions and actions. However, Jadad and Enkin (2000) highlight that the new era of information poses significant challenges to the processes of knowledge creation, dissemination, and application in healthcare systems.

Technology has enabled enormous volumes of information to be generated and readily accessible. This trend has been extenuated by the Internet as well as many tools that allow the rapid and wide dissemination of information. A remarkable similar information revolution occurred during the 16th century when laboriously transcribed manuscripts were replaced with rapidly reproducible and portable printed books (Drucker 1999; Eisenstein 2005).

In fact, despite all the benefits of the new era of information revolution, many knowledge workers feel uncomfortable in fulfilling their tasks as they often have to try hard to keep up with the knowledge being generated in their field (Jadad et al. 2000). One common and notable issue is that with so much knowledge available, knowledge workers cannot possibly absorb it all. The exponential growth of formal research studies is generating new and rich sources of scientific information at an unprecedented rate (Anderson and Graham 1980; Benseman and Barham 2009). In the field of biomedical research for example, medical knowledge doubles in amount every 2 years and physicians need to know many of the half a million articles added each year to the biomedical literature (Wyatt 1991; Hanka and Fuka 2000; Davenport and Glaser 2002).

Today, one of the major challenges for knowledge workers is to narrow the gaps between what they could know and what they do know and between what they think they should do and what they really do. While not restricted to healthcare, all

knowledge workers have the problem of staying on the top of the knowledge available in their field. However, unlike other fields, healthcare errors are life threatening.

The increasing gap between the creation of biomedical knowledge and the capacity of healthcare workers to acquire that knowledge may have significant impacts on the healthcare delivery process and it can undermine the quality of the care with some severe consequences. This is consistent with the finding of Davenport and Glaser (2002) that show more than a million injuries and as many as 98,000 deaths each year are attributable to medical errors and more than 5% of patients had adverse reaction to drugs while they were under medical care and nearly half of them were either serious life threatening or fatal. Some of these mistakes result from carelessness, but most occur because the clinicians must track a massive amount of complex information. Nichols et al. (2008) categorize medical errors into three major categories: lapse of memory or slip in attention due to tiredness and shift work; error of judgment due to misinterpretation of patient situation; and errors due to lack of knowledge and inaccessibility of right information resources. Two of these three major categories contributes to more than 50% of errors and can be directly related to the lack of knowledge or the ways information is organized and/or presented. In fact, in many cases information and knowledge presentation are ineffective and do not meet the specific requirements of healthcare service delivery and can have detrimental effect on medical decisions.

From medical decisions view, healthcare workers need fast and complete access to the right information that is consistent with the current medical status of their patients and is presented at the correct level of abstraction. The ability to correctly and efficiently process mass quantities of information are central to correct and timely decisions and to achieve this, it is imperative to consider the context of information in order to make appropriate judgment (Eichler et al. 2004; Chaudhry et al. 2006).

3   Knowledge Management in Healthcare

Healthcare decisions today need to be based on evidence and such a decision making process is an essential practice for all healthcare workers regardless of where they work and what sources of information they have access to. The effectiveness and reliability of the evidence in turn depends on the ability of healthcare workers to access relevant and current knowledge bases. This concept is valid for any health-care decision maker irrespective of whether they work in an advanced and high-end hospitals in a developed country or working in remote areas of a developing country (Mouhouelo et al. 2006).

Medical decision making requirements are mainly concerned with the explicit aspect of knowledge that is captured and codified so as to provide a formal evidence base for the decision. As Al-Hawamdeh (2002) states there is wide agreement that such explicit knowledge can be considered information. However, knowledge by its very nature depends on other knowledge to build on and draws on individuals' personal construction of reality (Sveiby 1999). This type of knowledge is referred

to as tacit knowledge that cannot be codified, but it is a dispensable part of all knowledge. Tacit knowledge is the most elusive way of knowing, but perhaps it is the most important way. "Know-how" is a knowledge created out of practice and collectively shared by workgroups and it is the part of tacit knowledge that can be explained or even codified (Teece 1998).

According to Benson and Standing (2004) the goal of knowledge management (KM) is to identify who has the relevant tacit knowledge and how others can identify, access and use that knowledge when they need it. On the other hand, explicit knowledge is also required to justify healthcare related decisions and ground it in the body of evidence. Knowledge management reflects a concern for developing a well-expressed and long-term plan for the intellectual asset of knowledge-intensive organizations that have to respond effectively to their dynamic, unpredictable, and complex environments. This situation fits well to the healthcare environment where the clinical decision making process is based on physicians' intuition and formal bodies of evidence (Wyatt 2001).

4 Task-Based Knowledge Management (TbKM) in Healthcare

For knowledge management to be effective and successful it must be a visible part of the work practice with outcomes that are supportive to organizations sustainability and performance. In the context of healthcare, Davenport and Glaser (2002) argue that successful and most promising KM initiatives are the ones that can "bake" and embed specialized knowledge into the jobs of highly skilled healthcare workers. This is consistent with task-base approach to KM (Burstein and Linger 2003) where the processes that create and exploit knowledge are clear and focus on tasks and their actors. In fact TbKM changes the focus of evidence-based clinical decisions from a target population to an individual patient by providing a framework to appropriately apply evidence in the patient's context.

As Burstein and Linger (2003) argue, TbKM represents a generic framework that can be applied in most knowledge work tasks. The aim of this framework is to acquire, represent, preserve and distribute knowledge, created as a result of performing a specific task (Burstein and Linger 2003). In this framework a "task" is defined as a substantially invariant activity with tangible outputs where "knowledge work" refers to the collection of knowledge based activities that constitute a task. We recognize evidence-based decisions-making as knowledge work since it is considered to be a rigorous knowledge intensive process with explicit outcomes (Straus and Haynes 2009; Sackett et al. 1996) as well as conceptual outcomes that includes knowledge creation and learning (Burstein and Linger 2003).

In task-based KM, the concept of community of practice (CoP) is central to the success of the KM process. It incorporates both individual and organizational perspectives into knowledge work activities. In general, a CoP can encourage innovation, collaboration and sharing of good practice by harnessing the power and knowledge of individuals into collaborating works and allows all opinions to be heard (Wenger

et al. 2002; Watson and Harper 2008). However, in the task-based framework, CoP plays a significant role in defining the task as a socially constructed activity. In such a setup, individual actors who form the CoP, perform their task with the help of technological components called "knowledge work support system" and they are responsible for deciding what knowledge is shared and when it will be shared. Therefore, it is necessary to maintain the integrity of each actor's individual perspective while the knowledge is shared within CoP.

From task-based KM perspective, in evidence-based medical decision making, decision making is considered a task where actors collaborate with each other and share their knowledge to achieve a particular decision. Based on this framework, activities such as research for finding relevant evidence is considered as part of the knowledge work carried out by CoP member. This shifts the process of evidence based decision making from independent decisions made by individuals to a collaborative decision made by the group of healthcare workers involved in that specific instance of that task. As the result decision makers are able to develop a common language for understanding their task, share meanings and, document aspects of the implicit knowledge that they applied to that instance of the task. This is a process of 'inscription' (Latour 1986) which can reveal the knowledge that is necessary for a reliable decision making.

Task-based KM also gives healthcare workers the ability to specialize their knowledge to fit the particular situation of a task. This instantiation allows each healthcare worker to exercise judgment and use her implicit knowledge to assess the applicability of existing material or past instances of the task to meet the contingencies of the current situation. Instantiation can have significant impact on the process of decision making where the supporting knowledge for a particular decision is complex or incomplete and past experiences of the situation can significantly contribute to the accuracy of decision. The contribution is not only in applying past experiences but also in recognizing the differences of past instances so that an appropriate approach can be applied in this instance.

In task-based KM, healthcare workers are located in a three dimensional space of doing/thinking/communicating. Within this space CoP validates the created knowledge and sanctions interpretations and meanings of the created knowledge by authorizing actors to make decision. This ensures that decisions made by healthcare workers are consistent as they accomplish their work activities in accordance with the body of knowledge sanctioned by the CoP.

Although task-based approach to knowledge management can make significant impacts on evidence-based decisions making in healthcare, implementing such a model as a Knowledge Management System (KMS) for professionals such as physicians is a challenging process. In many situations blending separate professional areas into a collaborative knowledge management process may be resisted as it may impact the influences of various contributors. In healthcare, physicians enjoy a high level of autonomy in making their decisions and they make decisions largely independent of other healthcare professionals. Findings from a study (Burnett et al. 2005) on a KMS implementation program in a healthcare centre shows that KM can change

the whole doctor–patient relationship. In reality KM is a shift in organizational culture and adopting a new paradigm of organizational relationship. It is influenced by how individual knowledge workers regard their knowledge community and the role they should play. This is in harmony with Alavi and Leidner (1999) notion of KM as a social and cultural process that is in alliance with its other organizational and technological aspects.

As a socio-cultural and socio-technical phenomenon, KM in healthcare needs to rely on the contribution of a range of different professionals with different areas of expertise. In knowledge-intensive communities such as healthcare that rely on services, innovations, and knowledge sharing, the focus needs to be shifted from merely individuals' knowledge to the underlying values that are communicated and adopted by its members. In fact, KM processes should be recognized as cultural values and become part of the mainstream activities. In this context the aim of KM is to create harmony, consensus and cohesion among the all contributors (Debowski 2006). Therefore, KM in healthcare should be seen as a long term commitments that can change the culture of healthcare to a more collaborative and proactive community. By achieving this goal KM can influence retention and productivity (Sheridan 2002) by constructing a strong organizational culture around its activities and ensuring stable and predictable values that are sustained over a long period (Smith and Rupp 2002; Jones et al. 2003).

5 Conclusion

The research presented in this paper supports the notion that better healthcare systems can be beneficial for economic outcomes and social development. However healthcare systems are under pressure from their both internal and external environmental demands. Healthcare, is a highly knowledge-based industry that relies on evidence-based decisions. However it needs to embrace appropriate approaches to knowledge management in order to effectively apply population based evidence to the particular situation of individual patients. In this paper we argued that TbKM can provide a framework for such medical decision making by incorporating evidence with a patient's condition and values. In this way TbKM improves the decision making process and contributes to the quality of healthcare and builds a strong collaborative culture between healthcare workers involved in those decisions. However, we acknowledge that the process of implementing a knowledge management system is a shift in organizational culture in healthcare as its processes can change the dynamics of the relations between healthcare actors and impact on the social structures of organization.

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