Knowledge Management Practices and Healthcare Delivery: A Contingency Framework

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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 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 conceptual in its nature and aims to propose a contingency-based framework to drive further empirical research. 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?'' We first discuss facets of performance in healthcare delivery but thereafter focus on the technical and interpersonal care aspects of healthcare delivery. We investigate knowledge management practices in the areas of (i) knowledge acquisition and sharing, (ii) knowledge assimilation and application. In our paper we explore how the different knowledge management practices affect the performance of healthcare delivery through technical and interpersonal care. Thereafter we explore the factors of physician characteristic, ailment characteristics, organizational IT infrastructure and organization processes, on which the conceptual framework will be contingent on. We thereafter evaluate the conceptual framework with a case study. From an academic perspective our paper identifies some key knowledge management 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 knowledge management practices can be properly implemented.

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

1. Introduction

Researchers have noted that knowledge management can be used to understand performance in organizations (Davenport and Prusak, 1998). Some recent studies such as those of Chen and Huang (2009) and Fugate et al. (2008) have noted that knowledge management process have positive effect on operational and organizational performance.

Healthcare delivery is a knowledge driven process and hence knowledge management (KM) 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, 247) has noted that knowledge management research in healthcare over the years has 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, 5668) 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 framework to provide an explanation of the application and impact of knowledge management practices in healthcare delivery. In terms of

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scope we are limiting the framework to focus on the impact of KM practices on measures of effectiveness and quality in clinical and patient care in the context of healthcare delivery.

The paper is arranged into three main sections. First we provide a background on aspects of performance in healthcare delivery and then a conceptual framework on the application of knowledge management practices and their impact on healthcare delivery, along with the contingent factors that affect these relationships, are developed and discussed. Thereafter, we evaluate the framework with data from a case study at a public hospital. Finally, the paper concludes with summary conclusions are drawn and further research recommendations are made.

2. Healthcare delivery and performance in KM context

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 (Shortell and Kaluzny) 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”.

Not only this, increasing cost of healthcare is putting pressure on access and quality of healthcare delivery (Blumenthal, 1999). Further calls for increased accountability, because of high rates of medical errors, and globalization which leads to demands of higher standards of quality, are also putting pressures on healthcare delivery organizations (Guptill, 2005).

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).

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 (Campbell et al., 2000, Dagger et al., 2007, Donabedian, 1988, Esch et al., 2008).

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, 71). 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 (Abalos et al., 2005, Hicks, 1997, Sackett et al., 1996).

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.

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 framework

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).

In the following sections we explore the existing practices and methods in healthcare delivery that support different KM processes and how they may impact patient care.

3.1 Social practices of knowledge acquisition and sharing

Many researchers (Davenport and Glaser, 2002, Gray and de Lusignan, 1999, Heathfield and Louw, 1999, Nicolini et al., 2008) 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 (Gray and de Lusignan, 1999, Heathfield and Louw, 1999, Meijboom et al., 2004, Nicolini et al., 2008). Gary and de Lusignan (1999) 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, behaviours 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 (Nicolini et al., 2008, Paul, 2006, Tagliaventi and Mattarelli, 2006).

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, 63, 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 behaviour, 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 (Addicott et al., 2006, Brice and Gray, 2003, Gabbay et al., 2003, Lathlean and Le May, 2002, Tagliaventi and Mattarelli, 2006). As such, CoPs and networks have implications for evidence-based medicine. Hence, it is proposed that:

Proposition 1: Involvement in social learning practices will have a positive effect on the practice of evidence-based medicine.

3.2 Knowledge acquisition and sharing through electronic medical records

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 that inhibits the adoption of EMRs 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-centred 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:

Proposition 2: The adoption and use of EMRs will be negatively related to the effectiveness of Interpersonal care.

3.3 Knowledge assimilation and application through clinical decision support systems

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, 765). CDSS aids in clinical decision making through analysis of patient-specific information in "comparison with an expert knowledge base" (Bose, 2003, 62). 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).

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 (Gray and de Lusignan, 1999, Nicolini et al., 2008). 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, Plaice and Kitch, 2003, Wales, 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 (Bose, 2003, Jadad et al., 2000). 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 CDSS 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 CDSS for the triple assessment in breast cancer care, has suggested that use of CDSS may result in improved compliance with evidence-based practice guidelines. Hence, it is proposed that:

Proposition 3: The adoption and use of clinical decision support systems will be positively related to the practice of evidence-based medicine.

3.4 Contingency factors

Lee and Choi (2003) have discussed about how KM factors (enablers) affect the outcome of KM processes. They also posit that managers might have to trade-off between the different KM enablers to achieve optimal performance. Becerra-Fernandez and Sabherwal (2001) in their research found that a contingency framework had considerable support in trying to access the appropriateness of KM processes.

In similar stead, 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 (Ambrose, 2000, Zeithaml et al., 1988). 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.

We identify four primary contingency factors that affect the impact of KM practices on healthcare delivery – physician characteristics, ailment characteristics, organizational IT infrastructure 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.

Hence it is proposed that:

Proposition 4: A physician's previous experience with KM practices will have a positive affect on his adoption and use of KM practices.

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. Hence, it is proposed that:

Proposition 5: Complexity of the symptoms and urgency of treatment will have a role on the choice of KM practices.

3.4.3 Organizational IT infrastructure

The importance of IT infrastructure for the implementation and success of KM initiatives have been well accepted in the literature (Junnarkar and Brown, 1997, Kruger and Johnson, 2010, Sher and Lee, 2004). In healthcare also IT infrastructure has been considered the groundwork for the implementation of KM practices and tools (Cain et al., 2005, Davis et al., 2009, Gray and de Lusignan, 1999)

Hence, it is proposed that:

Proposition 6: Higher level of IT infrastructure and support would be positively related to the adoption and implementation of EMRs and CDSS.

3.4.4 Organizational processes

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 methods and tools.

But 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). Hence, it is proposed that:

Proposition 7: Involvement in social practices of knowledge acquisition and sharing would be negative effect, if such practices were to be excessively formalized.

4. Case study – KM practices at a large public hospital

This section provides an excerpt from a case study conducted at a large public hospital in Thailand, where we tried to explore the KM practices and how they impact healthcare delivery and in particular patient care.

The hospital was a 500 bed tertiary level public hospital. It was part of 9 hospitals that were governed by a local government body. The hospital employed more than 850 healthcare professional and has a total employee count of around 1,600. We collected data for the case study using personal interviews, document reviews and through observations. In the sections below, we discuss some of our findings.

Knowledge acquisition and sharing

Physicians and other healthcare professionals noted that continued education to keep in touch with the most updated information and evidence played a very important role in their professional life. While they mentioned different pathways to acquiring and sharing knowledge amongst them, there was a definite preference for informal and social practices for sharing knowledge.

Almost all physicians and other professionals at the hospitals were members of discipline based professional associations that provided them with regular opportunities to interact with peers. In many cases it was mandatory to attend seminars, conferences and training programs organized by the professional associations to maintain membership. In most departments in the hospital there was a departmental budget to sponsor physicians and other professionals to attend such conferences and seminars, but in many cases the physicians choose to attend on their own accord or had external sponsors.

Physicians mentioned casual meetings such as coffee breaks and lunches as important for knowledge sharing. They stressed that provided the right kind of environment exists, these provide the opportunity for instant feedback and clarification from peers. We observed that within the hospital some departments put an emphasis to build up camaraderie and trust amongst the physicians to facilitate such informal exchange of knowledge.

As such, we found support for Proposition P1 that involvement in social learning practices will have a positive effect on the practice of evidence-based medicine.

Almost all physicians and other professionals at the hospital agreed that correct and complete patient information, when maintained in a repository improves healthcare delivery. The case study hospital dealt with a large number of patients (on average the hospital has around 500,000 out-patients and 15,000 inpatients per year) and getting access to patient records in short periods of time improves patient care. Right now, although the information system that the hospital uses, has implemented electronic medical records, it is still not fully paperless and physicians presently use paper-based forms to record their observations. These paper-based forms are later scanned and uploaded into the repository. Although the physicians did not agree that using EMRs would affect physician-patient communication, it was not possible to evaluate Proposition 2, as the EMR used at the hospital was not entirely paperless.

Knowledge assimilation and application

We saw two main methods in which physicians applied evidence based medicine. One was to incorporate patient specific assessments and recommendations from the different IT systems in their clinical decision-making, and second was to try and follow specific evidence-based clinical protocols and guidelines while treating certain ailments. Both these methods presented challenges. Incorporating patient specific assessments and recommendations were not easy because the physicians did not necessarily at all times had access to the different IT systems that contained such information, due to lack of IT system integration. In case of clinical protocols and guidelines, many physicians were of the opinion that these either in many cases were simple or did not reflect the most current and updated evidence available.

Furthermore, we did not see evidence based decision making as being a part of the clinical workflow as of now. With updating of the clinical workflow and also with IT systems integration in the future, such processes might be possible. Hence, due to the lack of CDSS in the case study hospital, it was not possible to evaluate Proposition 3 that the adoption and use of CDSS will be positively related to the practice of evidence-based medicine.

Physician characteristics

We found support for Proposition 4 as physicians in the hospital agreed to the fact that previous experience helps in adoption of KM practices. They also emphasised the role of appropriate training in helping to adopt KM practices, especially IT systems. Furthermore, physicians noted that attitude towards knowledge sharing is also very important. Many physicians stated that they choose to work in

the hospital because it promoted a culture wherein senior physicians took an active role in guiding less experienced physicians.

Ailment characteristics

Physicians agreed that the ailment that the patient presents himself with, will be an important factor in deciding the decision making process selected, For example, for patients that present themselves in emergency department the treatment plan chosen by physicians are mostly from experience, as these decision are taken in very short periods of time. Similarly, for complex cases the clinical protocols are mostly not enough and physicians have to normally consult with other physicians or source of information to get more clarifications before any clinical decisions are being made. Hence from the case study, we found some support for Proposition 5.

IT infrastructure

The hospital top management was eager to embrace IT in hospital operations, and hence investment was made to adopt and implement IT systems for different departments. While this laid the groundwork to adopt KM practices, there was not enough integration of the different IT systems to allow for smooth information flow across the different departments.

Hence, though we find support for Proposition 6 that higher level of IT infrastructure and support would be positively related to the adoption and implementation of EMRs and CDSS, IT infrastructure alone is not enough. Appropriate integration of IT systems is an important aspect as well.

Organizational processes

Due to accreditation and quality management requirements, there exist in the hospital various formal committees, which were important for sharing knowledge. For example, in the hospital several "Patient Care Teams (PCT)", many multidisciplinary, were constituted for particular ailments and activities. Amongst other things, the PCT teams are normally responsible for revising or drafting evidence based clinical protocols/guidelines and conducting Risk Analysis. Although these PCT teams were formal, there were no clear personal benefits and rewards for physicians to be part of the team. Physicians acknowledged the positive impact of the PCT teams on patient care and in knowledge sharing between the team members. As such we could not find enough support for Proposition 7 that knowledge acquisition and sharing would be negatively effected, if social practices of knowledge sharing were to be excessively formalized.

5. Summary and further research

Through literature analysis and a case study, this paper had sought to develop and evaluate a contingency based framework to understand the impact of KM practices in healthcare delivery, especially on evidence based medicine and interpersonal care.

The adoption of EMRs can impact the efficiency of healthcare delivery in terms of capturing and sharing patient data among the different caregivers. 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 integration) 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.

In this paper our propositions were mostly derived from the literature, but further hermeneutic research may be needed to develop constructs with clear conceptual definitions. Furthermore different countries have very specific healthcare environment and context, and might require need further exploration.

Also in this paper we have primarily focused on *clinical effectiveness and patient care*. Future research may want to explore more on the other aspects of healthcare delivery such as patient satisfaction, perceived service quality, and efficiency and utilization measures in the areas of cost.

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