



Healthcare knowledge sharing among a community of specialized physicians

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Abstract

Healthcare organizations strive to make the best use of their organizational knowledge. The collective know-hows of the medical workers directly affect the quality of the delivered healthcare services. This study addresses the healthcare knowledge-sharing among a community of specialized physicians. An extensive study of the literature on knowledge-sharing in industries generally and healthcare organizations specifically were presented. Six focal elements were detected in previous attempts to address the knowledge-sharing status in healthcare organizations. Additionally, three previous models for healthcare knowledge management were analyzed. The studied literature along with the three studied models helped in constructing the framework and suggesting a suitable research methodology for primary data collection. Qualitative approach of in-depth interview technique was used for interviewing eight specialized physicians. The data collected from the interviewees were then analyzed and produced explanatory themes and codes. These themes are physicians' acquisition of medical knowledge, staff participating in the knowledge sharing, knowledge-sharing culture, ICT-based knowledge sharing and top management involvement. The findings resulted in recognizing four considerations which ought to be taken into account for successful knowledge-sharing activities and learning initiatives in the healthcare organization. Conclusions and recommendations for future studies were presented based on the implications of this research study.

Keywords Healthcare knowledge · Medical knowledge · Healthcare knowledge sharing · Physicians' knowledge

1 Introduction

The intensity of competition among organizations has urged these organizations to rebuild their organizational structures to suite the flexible formation and use of organizational knowledge (Geuna et al. 2014). There is a growing number of studies in the field of organizational knowledge that aim to realize adequate methods for managing this type of

knowledge (Carron and Talbot 2014; Siciliano et al. 2013; Hezarkhani 2014; Rodrigues et al. 2015; Trivellas et al. 2014). The studies and practices dealing with organizational knowledge have initiated the development of the theory of knowledge management in organizations (Rossi and Rosli 2013; Hu et al. 2015). The focus of these studies was on the utilization of the knowledge existing within a community of employees in order to improve their performance and ultimately to achieve its organizational objectives (Scandura 2015). Well-managed and properly utilized organizational knowledge can aid in achieving business excellence and competitive edge in the today's rapidly changing marketplace.

Among various industries and organizational domains, healthcare organizations have a particular significance due to their close association with people's quality of life and well-being. The efforts of healthcare organizations are focused on providing quality services and ensuring adequate delivery of medical care which are mainly related to the admission, diagnosis, and treatment of patients. The demand for high-standard, affordable, healthcare services have urged

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governments, investors, practitioners and researchers to utilized the best available approaches and to invent new methods for managing healthcare knowledge (Adler-Milstein et al. 2014).

Healthcare organizations provide medical diagnosis, treatments, and follow-ups for wide range of medical specialties. Among these departments and specializations, cardiology is considered to be a crucial medical specialization since it deals with the diagnosis and treatments for illnesses of the human cardiovascular system. This specialization takes its importance and vitality from the fact that it deals with the most important organ in the human body. Providing quality cardiovascular care represents a major concern for public and private healthcare organizations. Comparing to other medical specializations, cardiology takes the lead in the amount of funds and expenditures by the management of these healthcare organizations. For instance, according to the recent federal report on heart diseases in Australia, cardiovascular care costs \$7.7 billons a year which represents 10.4% of the total national annual healthcare expenditures (Heart Foundation 2016). Due to these reasons, this specialization continues to attract the attention of interdisciplinary efforts of the practitioners and researchers with the aim of providing quality cardiovascular care as orderly and timely as possible.

2 Research objectives

The objectives of this research study are:

1. To study the relevant literature on knowledge sharing in healthcare organizations.
2. To investigate the current status of knowledge sharing in among community of physicians in a selected healthcare organization.
3. To identify the considerations to be taken into account for successful knowledge-sharing activities in healthcare organizations.

3 Research problem

There has been ongoing research in the field of healthcare knowledge in determining the factors to be considered in the sharing and managing of healthcare knowledge. This knowledge is being stored and circulated among physicians' communities in healthcare organization. The salient factors are essential to ensure the effectiveness of deploying the methods and approaches for knowledge sharing (hereinafter KS). Literature has shown that various factors have been considered, but they are treated as independent dimension in which in our study they have been considered them as

gaps. The gaps in these studies can be addressed in four categories:

1. Intangible approach and results

The first direction in the studied literature of knowledge management in healthcare organization tend to focus mainly on studying knowledge from financial standpoints that depend on yearly estimates of market shares and organizations revenues. This direction in literature was found in the work of Fauzi and Anshari (2016) who based their approach on key performance indicators—KPIs, in organizations as a measure for proper management of healthcare knowledge. Likewise, Adler-Milstein et al. (2014) discussed the return on investment—ROIs, when managing medical knowledge in healthcare organizations. However, knowledge in healthcare organization is not limited to quantifiable and tangible assets since most of the innovations, production, and delivery of services are the output of the application of the skills and know-how of the workers in these healthcare organizations (Crass and Peters 2014). Some of these know-how and skills represent essential prerequisites for the employees' performance such as the communication, interpersonal, critical thinking, problem-solving, teamwork, and self-management skills (Williams 2015).

2. Elements of healthcare knowledge-sharing

The third direction of studies was focusing wholly on the organizational practices performed by workers in healthcare organizations and overlooked the inter-related elements participating in the creation and sharing of knowledge (Chen 2014). Addressing these inter-related elements and the role of each element is the key for proper sharing of knowledge in healthcare organizations (Schmidt and Wiil 2015; Alajmi et al. 2015). The importance of these elements has been found in some studies related to the healthcare knowledge Sharing (Lau 2004; Bali et al. 2009; Wickramasinghe 2010), yet it was not properly and fully explained. There is a need for an up-to-date studies that address the new trends in the healthcare sector and its ICT solutions.

4 Aim of the research

The study aims to investigate the acquisition and sharing of knowledge in healthcare organizations. The knowledge is being studied from the viewpoint of community of specialized physicians. The primary data collection technique is aimed at eliciting physicians' inputs on their activities when acquiring and sharing of healthcare knowledge and the role of ICT in facilitating these activities.

5 Knowledge sharing in industries

Organizations operating in various sectors are increasingly realizing the impact of knowledge sharing and collaboration among their employees. There has been a considerable number of studies conducted in different industries to draw attention to the importance of adequate knowledge-sharing systems in organizations. Razmerita, Kirchner and Nielsen (2016) studied the role of social media in sharing organizational knowledge among employees in SMEs in Denmark. Chugh (2015) investigated the exchange of knowledge in Australian universities. Other studies were focused on the loss of time and resources when knowledge sharing doesn't take place properly in software development companies (Khoza and Pretorius 2017). Although these studies have asserted the essential need for the existence of adequate knowledge sharing, they have not explicitly addressed practical solutions. This type of studies provides narrative insights on the current status of KS in industries yet they were not indicative of clear layouts for organizational KS.

However, there have been recent attempts to devise frameworks and systems to support the knowledge-sharing activities in organizations. For instance, a model for knowledge sharing in public service departments that fall under Kenya's county governments (Ingari and Ali 2017). Their aim was to support the decision makers in selecting successful outsourcing strategies in these county governments. In the education sector, Abdullah and Haron (2014) suggested a system for knowledge sharing in higher learning institutions, and this system focused on categorizing of academic knowledge research institutions. A group of researchers in the domain of organizational knowledge sharing suggested the basic knowledge-sharing model for the sharing of tacit and explicit organizational knowledge (Kharabsheh et al. 2016). Their model is considered to be a variation of the SECI model of knowledge conversion (Nonaka 1994); however, they emphasized mainly on the sharing of the tacit knowledge in organizations. These attempts and their outcomes varied from one industry to the other yet they all aim to foster the exchange of knowledge among workers in the organizations. In spite of their persistent attempts, these solutions have not inclusively considered all aspects involved in the knowledge sharing in organizations. Some of these aspects are the employees' communication, organization's culture, and top management role in supporting KS. Other studies have indicated the impactful role of these aspects in separate studies, such as the research conducted in 11 organizations in Vietnam (Ha et al. 2009). Another perspective of the Vietnamese enterprises was investigated by Nam (2015) who studied the critical factors influencing knowledge management

in 92 organizations. Notwithstanding the implications of these studies, there is a need for a comprehensive study that includes various aspects involved in the knowledge sharing in organizations.

Research efforts in the field of organizational knowledge sharing and management have been addressed by several scholarly special interest groups and scientific societies. IC3K is a scholarly society that aims to consolidate researchers', engineers' and practitioners' efforts in optimizing the organizational knowledge sharing and management. The international conference on knowledge management and information sharing (hereinafter KMIS) is one of three main IC3K scholarly conferences. Since 2009, KMIS conferences have put forward research ideas, plan and implementations in organizational knowledge sharing and management. Recent study in this conference analyzed the processes, measures, and behaviors in Sweden enterprises for knowledge sharing and its impact on the level of innovation in those enterprises (Obeso and Luengo-Valderrey 2016). Whereas Pham et al. (2015) suggested the use of an ontology to share knowledge among users in bio-imaging industries, other studies attempted to use knowledge engineering to detect knowledge in the business emails in software design companies (Francois et al. 2014). The awareness of sharing of relevant knowledge in crisis management has been addressed by Sediri et al. (2013). These KMIS studies indicated the growing interest of academia and enterprises alike in the organizational knowledge sharing.

Practitioners as well as academics tried, and still trying, to formulate concepts, models, and theories to realize new methods for detecting, documenting, and utilizing the organizational knowledge. Their efforts were motivated by the simple notion that the efficient and continuous knowledge-sharing among workers is expected to improve their performance. Well-informed knowledgeable workers can adapt faster to the business changes. Most of the produced research has been viewing the problem of knowledge sharing from the viewpoint of mere forms of administrative and cultural aspects, or in pure financial terms. Although these aspects are important to be considered, there is still a need to comprehensively approach the problem of knowledge sharing in organizations. This study intends to bridge this gap in the research by providing an account that is inclusive of the elements which primarily partake in the organizational KS activities.

6 Knowledge-sharing in healthcare sector

6.1 Why healthcare organizations' context

Knowledge sharing in the healthcare organizations has a particular significance comparing to other industries. This

particularity justified by the close association of prompt KS with the delivery of quality healthcare services. Consequently, the type of the delivered healthcare services directly affects peoples' lives, health, and well-being. Healthcare organizations efforts are focused on preparing a well-informed medical staff who have relevant knowledge for providing sound diagnosis and treatment of admitted patients. Additionally, the continuous demands for high-standard affordable healthcare services have urged governments, investors, practitioners, and researchers to devise new approaches for adequate KS (Adler-Milstein et al. 2014). Healthcare industry contains some of the largest organizations in the world, at close to 10 percent of global GDP (LSHC 2016). Future efforts and investments for improving healthcare knowledge-sharing are expected to increase over the coming years (Marsilio et al. 2017; Hamouda et al. 2016).

6.2 Literature on healthcare knowledge-sharing

This section presents studies that attempted to meet the knowledge-sharing' needs in the healthcare organizations. The following paragraphs explore literature on the role of medical staff, utilization of textual ontologies, computer-supported cooperative work (hereinafter CSCW) on optimizing the healthcare knowledge management. The selection of literature on these topics was based on three main criteria. The first criterion is the relevancy of these articles to the research topic which is the knowledge sharing in healthcare organizations. The second criterion was the inclusion of recent studies in the last 5 years for the period of 2013–2017. The third criterion was the inclusion of research work that was published in reputable scientific journals, conferences, and societies to provide rigor and trustworthiness in the presented literature.

Jansen et al. (2015) studied the vital role of efficient knowledge exchange for sustainability of academic collaborative centers for public health in the Netherlands. Systems used in managing healthcare services are much compounded with internal and external entities; it involves several participants operating in diverse domains needs to be coordinated in order to deliver quality healthcare service to patients (Platis et al. 2015). These participants may be general practitioners, specialized physicians, nurses, medical assistants, clerks, and general workers. Based on the interactions between these participants, the amount of generated knowledge is massive, while all of knowledge created the partners is necessary for a successful healthcare service delivery. Identifying employees and their roles in knowledge sharing across departments in organization has been a focal interest for several researchers.

Medical knowledge in healthcare organizations are built in several forms such as databases, experimental data,

medical images, structured, or unstructured contents. One of the most important types of healthcare knowledge structures is the medial ontology. These ontologies help in defining a meta-vocabulary and then link the different terms in those sources, then it will be easier to query them in an integrated fashion (Guo et al. 2017). Once the ontology is described along with its terms and their relationships, it can then be passed to computerized systems. Then to use it reason the queries/questions. Inferring of new relationships based on the existing ones (Kolias et al. 2014). Examples for the known ontologies in the healthcare domain are the comprehensive medical ontology SNOMED using more than 400,000 terms (Silva et al. 2015), FMA ontology for anatomy (Golbreich et al. 2006) and GENOM ontology that deals with the study of the humane genes (Sokolov et al. 2015).

At the heart of these solutions, the engineering of medical knowledge base has been the cornerstone for research efforts in the past two decade. For instance, Dhombres et al. (2017) developed a medical knowledge base for ectopic pregnancy based on the annotation of clinical images. Furthermore, Woensel et al. (2015) proposed a multi-strategy semantic Web reasoning for medical knowledge bases. Likewise, Campbell et al. (2017) attempted to utilize a knowledge engineering model to predict patient-specific dose of treatment in pediatrics. Correspondingly, Soualmia and Charlet (2016) analyzed existing methods in representing the healthcare knowledge, and they recommended the use of user-friendly technologies suitable for clinicians' needs of knowledge sharing. Their approach was inspired by the work of (Charlet et al. 2006) who drew attention to the building of ontologies based on medical records in intensive care units. These approaches concentrated primarily on the engineering of knowledge based on the terminologies used in the documented explicit knowledge in healthcare organizations.

Researchers' efforts in the interdisciplinary research area of utilizing technology for the healthcare sector were evident in the CSCW research field. Tixier and Lewkowicz (2015) discussed the use of technology in assisting the learning of caregivers who are the spouses of Alzheimer's disease patients. A group of researchers in the CSCW field collaborated to identify techniques and methods for co-designing healthcare technologies. Their approach was based on sociology and ergonomics to provide relevant technological solutions in the healthcare sector (Bay et al. 2017). Knowledge-sharing techniques in healthcare sector has been connected to an exceptionally expansive range of organizational exercises intended to oversee, trade, and make or improve knowledge resources in healthcare organizations (Araujo et al. 2015; Gattnar et al. 2015).

The synthesis of the reviewed literature pointed out the attempts to meet the knowledge-sharing needs in the healthcare sector. These attempts ranged from proposing efficient

practices to suggesting technological solutions for the healthcare knowledge sharing. Thus, the examination of these attempts and studies participated in identifying six major elements for healthcare knowledge-sharing. These elements are considered to essential for effectual knowledge sharing in healthcare organizations. These elements are presented in the following paragraphs and are further investigated in the primary data collection phase of this research project.

6.3 Six elements for healthcare knowledge sharing

The studied literature indicated several pivotal elements that have been emerged from the researchers' attempts to come up with plausible approaches for healthcare knowledge sharing. These elements materialized from the interdisciplinary studies in the field of knowledge sharing in healthcare organizations. These elements are: (1) acquiring of knowledge, (2) people dealing with knowledge, (3) knowledge-sharing culture, (4) knowledge repository, (5) ICT-supported KM, and (6) top management reinforcement. These elements have considered the processes, concepts considered for providing systems, and models for healthcare knowledge-sharing. The following sections demonstrate these elements and the relevant literature.

1. Acquisition of knowledge

Literature review throughout this chapter has indicated several recent research articles with the focus on exploring acquisition of knowledge in organizations. Among these articles, the work of Sarkheyli et al. (2016) emphasized the importance of knowledge acquisition in knowledge-sharing in organizations. Likewise, the work of Imamoglu, Ince, and Karakose (2016) was concerned with the impact of knowledge acquisition and assimilation in organizations that strive to achieve competitive advantage. Additionally, proper acquiring of knowledge in organizations has been reported to be a decisive factor in managing knowledge in organizations, especially in the organizations that depends on knowledge-intensive teamwork (Chuang et al. 2016).

2. People dealing with knowledge

Identifying employees and their roles in knowledge sharing across departments in organization has been a focal interest for several researchers. Employees who are better informed and have relevant knowledge to perform their duties represent an integral part in managing knowledge in organization (Gunduz 2016). Innovation in organizations depend greatly on the know-how of its employees, these employees are more expected to be innovative when exposed to relevant knowledge (Mutlu 2015). The performance of these employees can be enhanced with the transparent exchange

of knowledge among other employees in communities, department and segment across the organizations (Vieru and Arduin 2016). Eventually, organizations are expected to maintain its growth and strive when its employees are continuously sharing knowledge among the communities in organizations.

3. Knowledge-sharing culture

One of the aspects concerned with the proper management of knowledge in organizations is the culture established for promoting the knowledge-sharing among employees. Establishing an adequate knowledge-sharing culture can directly improve the performance of employees and the organization as whole (Alsam et al. 2016). Collaboration can be improved if knowledge is continuously shared among workers within a culture that fosters knowledge-sharing activities (Marouf 2015). Thus, the collaboration and communication are likely to be improved when knowledge sharing exists to foster knowledge exchange among employees in organizations.

4. Knowledge repository

Knowledge repository is concerned with retention of organizational knowledge in order to make use of the stored knowledge in organization. The structure, capabilities and location of the knowledge repository has been focal in the work of Ghorbian and Saffari (2016) who indicated its importance to the knowledge-sharing activities. The main aim for these knowledge bases and repositories is to gather the organizational knowledge and make them available to the employees in organizations (Bartlett 2016). The lack for a well-structured knowledge repository negatively impacts the performance of employees in organizations (Kaushik 2013). Therefore, it is essential to consider this aspect when constructing approaches for managing and sharing knowledge among employees in organizations.

5. ICT-supported knowledge sharing

Researchers and practitioners had asserted the importance of integrating modern technologies to optimize the knowledge management in organizations. Manus (2016) examined the main factors influencing knowledge sharing in organization; he reached to the conclusion that organizations which utilize technological tools are more expected to succeed in launching knowledge sharing and learning initiatives. Likewise, Andreeva and Kianto (2012) explored the critical impact of ICT solutions on organizational knowledge, organizational practices, and the competitiveness of organizations over business rivals. Additionally, research articles had suggested the alignment of technology use in knowledge management with organization goals in achieving growth and competitive

edge (Dali and Shaalan 2016; Stylianou and Savva 2016). Based on that, it is necessary to address this element into approaches aim to optimize the sharing and management of knowledge in organizations. @@

6. Top management reinforcement

Due to the centralized nature of administrative hierarchy and decision-making style in organizations, it is imperative to pay attention to the critical role of Top management in knowledge management and knowledge-sharing initiatives. The important role of top management in overseeing and launching KM initiatives has been addressed by many studies conducted by researchers and practitioners. Some of these studies focused on the influence of top management on knowledge exchange among employees (Muinde et al. 2016). While other articles indicated the top management support and commitment are required for to ensure successful knowledge sharing plans in knowledge-based organizations (Syysnummi and Laihonon 2014). Therefore, it is essential to consider this element when devising plans, approaches, or frameworks that aim to improve the sharing and management of knowledge in organizations.

6.4 Previous healthcare knowledge management models

Key improvements in healthcare knowledge management (hereinafter HKM) have been focused mostly on productivity issues and given less attention to the methods involved in sharing and managing of knowledge in healthcare organizations. Studies in the field of HKM has shown several existing policies and practices, but they have not been effective in actualizing adequate methods in delivering quality healthcare service and meeting the medical organizations objectives (Grönvall and Kyng 2013; Rexhepi 2015; Matshwane 2015). Several healthcare organizations have taken the approach of viewing these practices as a profitable vital resource, and knowledge sharing between representatives seems to be originated from formal and informal knowledge sources. One of the most vital elements for effective HKM policies is to encourage the workers to join the knowledge-sharing activities inside of the healthcare organization (Ahlan and Ahmad 2015). Other healthcare organizations have taken the path of enforcing the workers to certain procedures that would enhance the quality, proficiency, and intensity of the healthcare services. These procedures are aimed at urging the staff to share knowledge that has impact on improving the performance and productivity of the healthcare organization (Khammarnia et al. 2014). HKM has also included the collaboration of social components that depends greatly on informal interactions among the medical staff, which usually involves implicit knowledge sharing.

The successful application of HKM systems has been connected to internal social practices of the staff communities (Knauth and Meinerz 2015).

The execution of HKM system likewise requires a comprehension of the knowledge management process to be carried out by suitable experts and managerial staff. In the healthcare centers, explicit knowledge, i.e., documented knowledge, is accessible in patient's records, exploration reports, and organizational databases. Whereas implicit knowledge is found in the minds of the healthcare professionals such as neurosurgeons, pediatricians, pathologists and cardiologists, nurses and medical assistants (Flottorp et al. 2013; Tahamtan and Sedghi 2014). This type of inferred knowledge surfaces when effective knowledge sharing takes place. The sharing of healthcare knowledge happens in the gathering of medical professionals' communities in conferences, workshops and specialized informal training.

There have been several attempts to develop models and frameworks for the proper sharing and management of knowledge in healthcare organizations. Among these attempts, the studied literature contained three frameworks dealing with healthcare knowledge management. The first framework, Knowledge Management Conceptualization in Healthcare, was developed by the School of Health Information Science, University of Victoria, USA (Lau 2004). The second model, Total Knowledge Management in healthcare (TKMh), was developed by Knowledge Management for Healthcare research subgroup in Coventry University, UK (Bali et al. 2009). While the third model, Knowledge Management Infrastructure in Healthcare, developed by, School of Business IT and Logistics, RMIT University, Australia (Wickramasinghe 2010). These frameworks and their constructs will be in the following subsection. The aim of these frameworks and their constructs will be utilized for suggesting the proposed framework and guide the primary data collection approach. These frameworks have been analyzed and discussed thoroughly as part of this ongoing research project. Therefore, they only be discussed briefly in the following section, the detailed analysis of these three frameworks and development of the study framework can be viewed in (Sabeeh et al. 2016).

6.4.1 Knowledge management conceptualization healthcare

The framework pays attention to the initializing of knowledge in healthcare organizations. It focuses on four aspects of the medical knowledge: The first aspect for this framework is the production of knowledge which encompasses collection, generation, synthesis, identification, codification, storage, packing and coordination of knowledge in healthcare organizations. The second aspect of this framework is the use of knowledge in healthcare organizations. This

aspect deals with the regulations adopted by decision makers for the exchange of medical knowledge. Part of these regulations focusses on the application and sharing of knowledge when needed. The third aspect of this framework is the refinement of knowledge which refers to the methods used for the integration and evaluation of healthcare knowledge.

6.4.2 Total knowledge management in healthcare TKMh

The Total Knowledge Management in healthcare (TKMh) approached the healthcare knowledge sharing and management in light of total quality management theory. Total quality management refers to continuous improvement of the processes involved in the knowledge management and sharing in healthcare organization (Andersson et al. 2006). This framework indicated the importance of employees' involvement in the knowledge-sharing activities for successful sharing of healthcare knowledge (Bali et al. 2009). This framework consists of four sequenced stages: The first stage deals with the learning of new knowledge to the employees in the healthcare organizations. The second stage focuses on setting plans for ensuring the transfer and sharing of knowledge among the medical staff, whereas the third stage deals with the establishing of structures and networks among segments and department in the healthcare organizations. The fourth stage (exploit) indicates the continuous improvement of the previous three stages.

6.4.3 Knowledge management infrastructure in healthcare KMIH

The framework focuses mostly on the social and technical tools and techniques required for the proper creation of knowledge in healthcare originations (Wickramasinghe 2010). This model presents five constructs that are required from proper knowledge management in healthcare organizations. The five constructs of this framework are Infrastructure for collaboration, organizational memory, human asset infrastructure, knowledge transfer network, and business intelligence infrastructure. This model has taken a different approach comparing with the other two models discussed in the previous two sections. The focus here is mostly on improving the processes of knowledge management by focusing on adequate infrastructures in the aforementioned areas.

7 Research methodology

This section is concerned with the selections of primary data collection, population, sample, and the rationale of these selections. Data gathering was conducted through the qualitative approach of in-depth interviews with open-ended

non-directive set of questions to investigate the phenomenon of knowledge management in a selected healthcare organization.

7.1 Objective of the research methodology

The aim of conducting the selected research methodology is to investigate the nature of knowledge being shared among physicians in the knowledge sharing environment. The analysis of the data collected from the interviews is projected to unraveling how knowledge is being acquired, learnt, and shared by the interviewed physicians both individually and collectively in the healthcare organization. The number of specialized physicians in such departments is relatively small. Therefore, the small number of available physicians, the social context, and the nature of the personalized medical knowledge that is being studied are all reasons for the suitability of interviews approach with open-ended non-directive questions since it provides more insights and inputs (Gavrilova and Andreeva 2012), unlike questionnaires which usually requires big number of respondents and have predefined set of answers (Delak 2016). The respondents' inputs will help in improving the developed framework for knowledge sharing in healthcare organization.

Additionally, these inputs in following stage of this research project which is the selection and implementation of an ICT tool which is utilized for supporting knowledge-sharing activities taking place in the community of physicians in the healthcare organization.

7.2 Peculiarity of the research method

The methodology adopted in this study differs from previous studies conducted in the healthcare knowledge-sharing's research field. Comparing to previous approaches, the study' methodology is peculiar in four distinctive ways. Firstly, this method examines the consolidation of physicians' ongoing individual knowledge acquisition as well as the collective learning within a community of physicians. The individual knowledge refers to the medical knowledge that had been acquired through institutionalized medical education as well as the self-learning activities, whereas the collective knowledge' learning indicates the type of medical knowledge gained through knowledge-sharing activities in a community of physicians. The consolidation of the individual and the collective knowledge of physicians have not been explicitly considered in researchers' methods in the healthcare knowledge-sharing field. Secondly, this method explores the knowledge acquisition and sharing in a context that has not yet been addressed by other studies. The context of this method is a public hospital in Iraq. The thorough study of the literature has indicated the lack for methodologies

concerned with the knowledge-sharing in Iraqi healthcare organizations.

Thirdly, the study's method focuses on experienced cardiologists as the main units of analysis. There is a lack for previous methodologies focusing primarily on cardiologists in healthcare organizations as the main units of analysis. Fourthly, the study's methodology additionally intends to focus on technological support, knowledge-sharing culture, and top management in healthcare organizations. This focus has not been considered in previous studies specifically from specialized physicians' (cardiologists) perspective.

7.3 Population and sampling

The selected context for conducting the primary data collection is one of Iraq's known public healthcare organization. The official name of this healthcare organization is 'Nasiriya Heart Center' which is located in Nasiriya City in Dhi Qar province in Iraq. The population of physicians in Iraq's public healthcare centers is the targeted population for studying the phenomenon of healthcare knowledge management. The population includes all the communities of physicians working in Iraq's public hospitals who are involved in knowledge sharing and learning activities such as emails, blogs, meetings, workshops, training, observational learning (also known as on-the-job training OJT). The general attribute of this population is that they are all working for public hospitals which administratively fall under the Iraqi Ministry of Health. A sample of the units (physicians) is selected based on specific criteria which are presented in the following section.

For the purpose of primary data collection, the purposive sampling that uses homogeneous sampling technique has been selected due to its suitability in eliciting a sample from the population of medical staff in the Iraqi public hospitals. The rationale behind selecting this method is its focus on dealing with units which has homogeneity among the qualities of the investigated individuals (Murphy 2012; Etikan et al. 2016). This sampling method is typically considered for research when the investigated phenomenon (in this case healthcare knowledge management) and has a specific common interest among the interviewed subjects (physicians). This technique enables the researcher to study units of analysis comprehensively (Alawaad 2015). Furthermore, this sampling method is suitable for implementing this research due to the limited number of specialized physicians who are involved in the knowledge-sharing activities. Comparing to other sampling techniques, this method is considered to be less subjective when choosing units from the population, the sampling of subjects is more descriptive to the population which aids in drawing sound conclusion of the phenomena. The data collected from the sample can help in making generalizations required when dealing with

the knowledge shared among physicians (Hutting 2015). The selected sampling method meets the intended purpose of collecting data from subjects (physicians) with certain attributes (years of experience, medical specialization, working with a specific department of the hospital and familiarity with specific themes and topics within the community of physicians). These criteria and attributes are agreeable to researchers' recommendations when conducting the homogeneous sampling (Barreiro and Albandoz 2001).

7.4 In-depth interview technique

The rationale of adapting the in-depth interview approach can be summarized in two main folds. Firstly, the research need for informative detailed inputs regarding the interviewees' opinions and behaviors (Robinson 2016; Lage and Alturas 2012) since these opinions provide realistic explanations of the phenomenon under study. Secondly, studies in the healthcare context recommended this approach for non-medical researchers to provide clear explanations for the readers (Blandford et al. 2015). Therefore, in-depth interviews aim to provide clear and descriptive outcomes from analyzing the data collected from the interviews. This research is concerned with investigating the knowledge management in the healthcare organizations with the focus on the knowledge sharing environment.

This approach is intended to elicit inputs from physicians who are directly involved with knowledge-sharing activities in a public Iraqi hospital. The selection of the qualitative approach of in-depth interviews with semi-structured questions was based on the research need for obtaining detailed explanations regarding the phenomenon under study. When conducting the qualitative approach of in-depth interviews, studies have showed tendencies to select number of interviewees that is not less than six nor higher than twelve (Guest et al. 2006; Wong and Hogan 2016; Gleasure and O'Riordan 2016). Data collected from less than six interviewees would be insufficient for the data analysis and might reflect incomplete understanding of the phenomenon under study, whereas selecting twelve or more interviewees would results in data saturation and redundancy when answers are being repeated or anticipated (Given 2008; Tukamuhabwa 2011). Therefore, eight interviewees (physicians) have been selected since it lies within the recommended range of correspondents and for the ease of the manual thematic analysis of the collected data as well as for the clarity in addressing the numerical representations of the interviews' findings.

7.5 Construction of the interview questions

The preparation of the interview questions is guided by the literature which is related to the approaches followed when collecting data qualitatively. The questions are phrased

clearly and meaningfully, and attention is paid to avoid any possible biases or leading statements and to ensure sufficient level of credibility. For the purpose of ensuring sufficient credibility, Shenton's strategies were followed when conducting these in-depth interviews (Shenton 2004). The questions were grouped into six sections based on the themes and elements of the developed framework for Healthcare Knowledge Management (Sabeeh et al. 2016) as depicted in Fig. 1.

The interview questions were communicated verbally without mentioning the headings and titles of these sections. This was advised by one of the experts who reviewed the questions prior to the interview. The interview questions and their aims can be viewed in Appendix 1 of this paper. The questions were sectioned only in this research document to reflect how it was constructed and to ease the process of analyzing the collected data. These sections are:

Section A (Acquisition of Knowledge) with three questions that aim to explore the formal and informal methods of learning which formed the physician's current knowledge. Additionally, it deals with the means followed by physicians when acquiring new knowledge and whether there are initiatives in place for continuous learning and development of skills.

Section B (People dealing with Knowledge) that has one expansive question which intends to elicit information on describing the role of medical and non-medical staff in the hospital who are involved in the knowledge-sharing activities.

Section C (Knowledge Sharing Culture) comprises three questions inquiring about the existence of culture that fosters effective sharing of knowledge and open communications among the personnel in the healthcare organization.

Section D (ICT-Supported Knowledge Management) consists of three questions which aim to inquire on the possible existence of technological means used for the knowledge-sharing activities. Additionally, these questions

aim to investigate physicians' perceptions on the availability of Web-based tool that facilitates their learning and knowledge-sharing needs.

Section E (Top Management Reinforcement) consists of two questions which aim to explore the role of top management in supporting and ensuring the proper management and sharing of knowledge among personnel across different departments in the healthcare organization under study.

The interview concludes by asking the physician about her/his views on recommendations for improving the knowledge management in the healthcare organization. Whenever there is a need to elicit further clarifications regarding any of the respondent's answers, probing questions were asked whenever there is a need for further clarifications. These probing questions were short questions like: Can you elaborate on that idea? Would you explain that further? Is there anything else?

8 Data collection and analysis

This section discusses the analysis of the data collected during the in-depth interviews with the selected physicians. The implementation of the data collection and data analysis procedures are presented in this section. The data were collected in light of the plan set forth for the primary data collection, and it depends on the replies of the eight physicians who represent the subjects for the primary data collection. The analyses of data were based on the techniques suggested by Creswell (2012) who has well-received viewpoints on the data analysis and representations when conducting qualitative research. Creswell's qualitative process of data analysis has been followed in this study, it depends on the manual detection of patterns in the collected data, and these patterns are then classified into themes and codes. These themes and codes have been utilized afterward for the grouping and the interpretation of the analyzed data. The initial analysis started with the details of the interviewed physicians' background, and the physicians' names were substituted with numbers to ease the following steps of data analysis.

The structure, headings, and elements of the conceptual framework continued to guide the data analysis. Based on that structure, the collected data were classified into six main themes. Each of these themes contained several categories based on the pattern detected in the physicians' responses. Some of these responses were synthesized into tables to directly reflect the physicians' perceptions when asked about the status of knowledge sharing in their healthcare organization.



Fig. 1 Healthcare knowledge management framework (Sabeeh et al. 2016)

8.1 Data collection procedure

The study uses in-depth interview method for the primary data collection; the interviewees were specialized physicians who are working at Nasiriya Heart Center in Iraq. Eight physicians were interviewed to seek their opinions on the phenomenon of healthcare knowledge management. The collected data were of qualitative nature since it was collected through direct interview questions during the interview time. Initially, the interviews were conducted using free calls services provided by Skype and WhatsApp applications and were recorded in audio format in order to make sure of the full documentation of the physicians' replies. An accurate and complete record for each interview was maintained, with these records containing the original audio recordings of the interviews, the transcribed textual format of the interview, name of the interviewed physician, date and time of the interview, and the signed consent forms.

Physicians' replies were rich and in-depth and came in form of long and short statements. Several probing questions were addressed whenever there is a need to envisage deeper details. Afterward, the recordings of these interviews were transcribed verbatim into textual format, keeping the full statements with the same recorded grammatical errors to avoid any possibility of subjectivity when analyzing the physician's replies. The textual formats of these interviews were sent back to the physicians in case they have further remarks and clarifications and to see if their replies reflect what they actually wanted to express. Six out of the eight interviewed physicians were satisfied with their replies, whereas two of them suggested minor changes and remarks to disambiguate some of the opinions expressed in the interviews. After receiving the feedback from the physicians, the analysis process began.

8.2 Data analysis procedure

The first phase of data analysis started with applying contents analysis which deals with the language used in physicians' replies. The contents analysis for the physicians' inputs were based on several activities like thorough reading and studying of the physicians' answers in order to understand the meanings of these answers and to realize any possible similarities or variances. Based on these understandings of the replies, several themes, codes and issues were detected based on the specifics and the elements of the developed framework for healthcare knowledge management. The detection of these codes is one of the focal processes in analyzing qualitative data. For this purpose, the analysis of the collected data followed the Open Coding technique. Open Coding was addressed by several researchers and experts in conducting qualitative research such as Strauss and Corbin (1990) who defined it as "the process of

breaking down, examining, comparing, conceptualizing, and categorizing data". Open coding technique was used for the categorization of the physicians' replies collected during the interviews. Several data analysis techniques were also utilized such as the sketching viewpoints, documenting notes, extracting codes, deducing several themes from these codes, counting frequency of codes, relating categories to relevant literature, and finally displaying the findings from these analysis techniques. The data analysis techniques followed in this study were inspired by the Creswell's qualitative process of data analysis (Creswell 2012) as depicted in Fig. 2. During the application of the data analysis techniques, several regularities were detected in the patterns of the physicians' replies. There are eight respondents (physicians) who are specialized in cardiology as their main medical specialty besides another subspecialty that they might possess. All of these physicians have over than 6 years in their main specialty and over than 15 years in their practices since their graduation from school of medicine. They are currently working at the healthcare organization which represents the context of conducting this study, the official name of this healthcare organization is Nasiriya Heart Center. This heart center is located at Nasiriya City in Dhi Qar province in Iraq. In addition to working in this center, some of these physicians provide their consultations in other hospitals, centers and clinics operating in the public and private sectors. The selection of the interviewees reflects a reasonable balance of specialties, years of experience in specialty and gender when these physicians were selected. This diversity in their profiles has aided in obtaining insightful inputs that covers wider range of issues related to the knowledge-sharing in the community of physicians. Additionally, the diversity of their background and expertise has reflected in more inclusive responses that can be expected to be more realistic, reliable and descriptive of the existing phenomenon of knowledge sharing in healthcare organizations. As a result, the findings are expected to be more dependable when drawing conclusions and recommendations for the validation of the research results and for the trustworthiness in the developed framework. Based on the approach followed in the work of Marcus and Ellen (2003), the following subsection represents the themes and codes that have been realized from the analysis of the respondents' data. The responses of the eight physicians were combined and synthesized into six main themes arranged in a sequence that is similar to the approach of constructing the interview questions, i.e., based on the elements of the conceptual framework for healthcare knowledge management. Consequently, the work of Marcus and Ellen (2003) has suggested the combination of themes rather than segregating them in order to increase the reliability of the data analysis and ultimately to draw sound conclusions. The combination of these themes is based on the developed framework which provides holistic and accurate

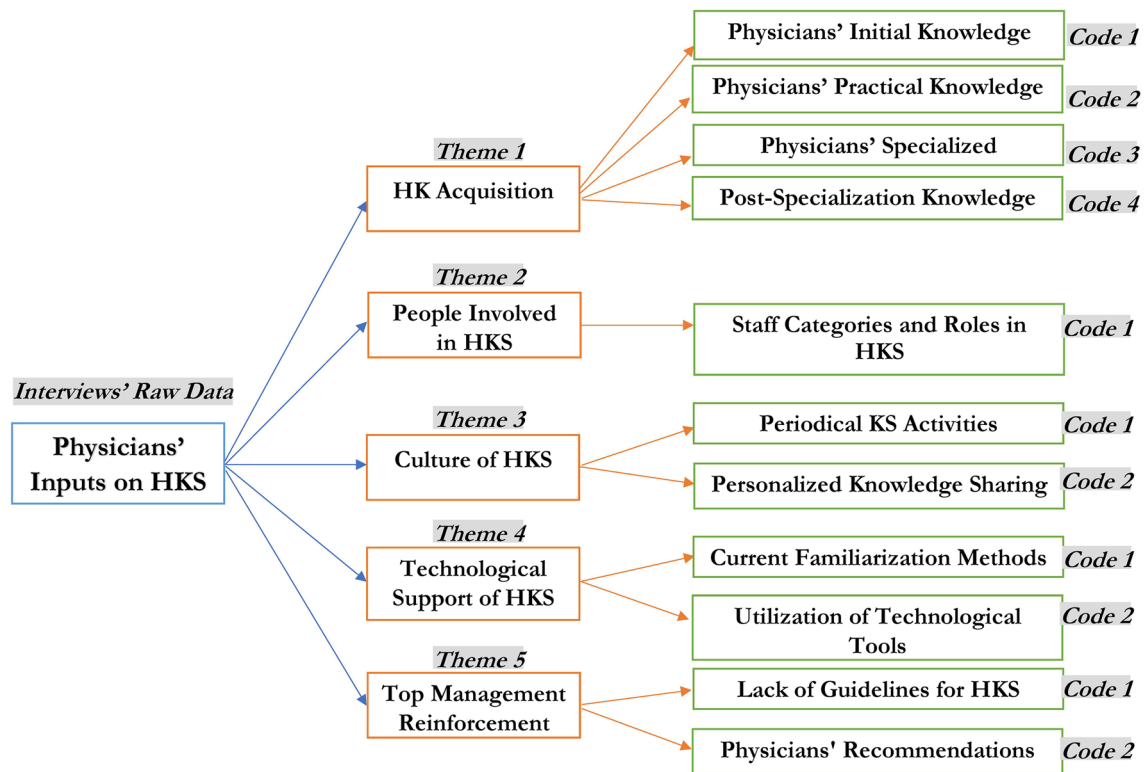


Fig. 2 Network analysis of the themes and codes

interpretations of the analyzed data. Ultimately, it aids in clarifying the findings and conclusions that is reported at the end of this research documentation.

8.3 Data analysis results

The results of the data analysis were grouped into five themes, these themes were then categorized into codes that reflects a summary of physician's perceptions on the questions addressed during the interviews. These themes and codes are mapped out in the network analysis for the collected data as shown in Fig. 2.

8.3.1 First theme: healthcare knowledge acquisition

Respondents explained the main events and milestones in acquiring their medical knowledge which has ultimately enabled them to practice their specialties and subspecialties. They have indicated formal and informal learning methods starting from their time as students in the school of medicine until the present time of working as specialists in the Heart Center. They have additionally expressed several techniques they followed to acquire new knowledge regarding new trends in their medical field of specialty. The following sources were derived from their responses when they were asked about the methods they followed, and still following,

in acquiring their medical knowledge that is necessary for their medical practice. Under this theme, physicians' inputs were grouped into four codes. These four codes are:

Code 1: physicians' initial knowledge The main source of their initial healthcare knowledge was mostly generated from the direct attendance of lectures during their undergraduate years at the school of medicine. During these lectures, they were recording the information that is delivered by senior lectures with experience in the subject being taught. These experienced senior lecturers recommended textbooks and additional reading material in order to familiarize the student with more knowledge which the lecturer might not have had the time to deliver during these lectures. All of the interviewed physicians agreed that this source is their initial source of familiarity with medical subjects. However, they expressed several techniques in documenting and the circulating these lectures during and after the lectures themselves.

Code 2: physicians' practical knowledge The physicians' learning and acquiring of new knowledge continued after they graduated. Upon their graduation, they started to obtain hands-on experience during the early years of working as general practitioners in various hospitals. Physicians No.4 these by stating that "In these hospitals I gain more knowledge by working with physicians who are older and more experience than I am". At this stage, they started to apply the methods and knowledge they learned during

their undergraduate years in addition to learning about new methods for diagnosing, monitoring, treating the admitted patients.

Code 3: physicians' specialized knowledge The interviewed physicians' accumulation of healthcare knowledge and experiences during their years of practicing as general practitioners has urged them to pursue higher medical education to prepare them for specializing in cardiology as their main specialty and other medical subspecialties that are closely related to or dependent on cardiology. Learning new procedures that are specific to the cardiology specialty is usually gained from 4 to 5 years of theoretical and clinical learning.

Code 4: post-specialization knowledge After gaining further experiences from practicing their specialties and subspecialties, they started to deal with more critical cases that directly relate to their specialization. Some of these medical cases contain symptoms, implications, and issues which they were not familiar with previously. For the purpose of tackling these issues, physicians started to update their knowledge by participating in workshops and conferences that deals with new trends in the cardiac diagnosis and treatment.

8.3.2 Second theme: people involved in healthcare knowledge sharing

The analyzed data showed another pattern of regularities in physicians' inputs which referred to an important factor in the update and circulation of physicians' knowledge. This pattern was categorized under the theme that expresses the role of other medical and non-medical staff in the knowledge-sharing and learning among the interviewed physicians. The replies of the eight interviewed physicians can be grouped under one code of analysis.

Code 1: staff categories and roles in HKS Based on the interviewees' feedback when there were asked about the people involved in the healthcare knowledge sharing, four main type of staff were considered to have more effective role in the knowledge sharing process. Firstly, senior nurses who provide advice to physicians regarding certain procedures and guidelines followed in the hospital when performing surgeries and admitting patients. Secondly, medical assistants who are usually more involved with the daily duties of the physicians; they represent the linkage between the patients, clerks and pharmacist on one side and with the physicians on the other. Thirdly, pharmacists who follow-up the prescription of medications and update physicians of the stock and arrivals of certain critical type of medicines. Fourthly, clerks who deal with initial admission of patients as well as maintaining history of re-admitted patients and information on the newly admitted ones. All of these medical and non-medical staff are working in several departments within the heart center, within the main departments:

anesthesia, intensivists, cardiology, cardiac surgery, heart diseases, congenital heart defects and pharmacy. Intensivists are physicians who have specialties and subspecialties which are relevant to the critical diagnosis and treatments of certain diseases (Marchan et al. 2010).

8.3.3 Third theme: culture of sharing the healthcare knowledge

The third theme is extracted from physicians' responses which were grouped under two directions. The first direction deals with the analysis of physician's perception on the current status of the knowledge-sharing culture, whereas the second direction deals with the analysis of physicians' suggestions for establishing an effective culture of knowledge sharing. The analysis of the first direction was based on the replies obtained from the two questions (B-1 and B-2). Physicians' responses under this theme were summarized into two codes.

Code 1: periodical knowledge sharing activities Out of the eight interviewed physicians, three physicians indicated that periodical meetings and tour supervised by the management were useful in updating physicians' knowledge regarding new trends in their medical specializations. These meetings occur monthly, weekly, and daily basis depending on the department and the need to relay new instructions or discuss critical medical cases.

Code 2: personalized knowledge sharing The five remaining physicians indicated different method of sharing of knowledge which is not supervised or arranged by the hospital's management. They mentioned another form of knowledge sharing that is personalized and direct. Most of these sharing activities took place within informal settings such as coffee breaks, phone calls, or face-to-face chats in the lobby of the physicians' residence building.

8.3.4 Fourth theme: technological facilitation for healthcare knowledge-sharing

The fourth theme was extracted from physicians' responses to the questions D-1, D-2, D-3 and D-4. These questions aim to explore physicians' immediate reactions when they are faced with new medical cases which they have not studied or came across before. Additionally, these questions inquire about physicians' perceptions on learning and knowledge-sharing benefits if they were introduced to a technological tool that facilitates the knowledge-sharing activities. The analysis of data collected under this theme can be summarized into two codes:

Code 1: current familiarization methods Physicians expressed their inclination to follow certain methods for familiarizing themselves with new medical knowledge regarding some new cases or a new detail in some existing

cases which they did not study or experienced before. For instance, physician #4 stated “I usually review several recent books and research then contact some colleagues and professors to discuss and decide on the best way to treat the patient. The communication is sometimes established with experts in the field, who might local or international”. These physicians followed these familiarization methods typically by either consulting other more-experienced specialized physicians, reading in the textbooks or searching on the internet.

Code 2: utilization of technological tools This category indicates physicians’ perceptions on the utilization of a Web-based tool that offers knowledge-sharing capabilities. The physicians were asked about the usefulness of the availability of such technological capabilities that enable them to collaboratively learn in the community of physicians. This technology if made available could offer them the flexibility of mixed mode knowledge-sharing of various types of media (such as video, wikis, blogs and social network) and help in tracing the profile and participation of physicians within the knowledge sharing environment.

1. Perceptions on a Web-based tool

Physicians’ responses were agreeable to the usefulness of a Web-based tool for efficiently share of knowledge in the healthcare organization. Physician #1 and #7 indicated that this kind of tool would be useful in saving time, the saved time can be relocated to for accomplishing other tasks, whereas Physician #2, #3 and #4 indicated the how this such tool can support the learning needs for the physicians in the knowledge sharing community. When asked this capability of the technological tool, physician #4 stated “It will greatly facilitate the updating our knowledge regarding recent research, discussion and communications with colleagues who have the same specializations.” While physician #5, #6 and #8 perceived the utilization of such tool as better alternative for the traditional communication methods like quick conversation or phone calls. Thus, the utilization of such tool would help the community of physicians in this hospital to quickly share knowledge and save time.

2. Perception on a mixed mode knowledge-sharing

Physician #1, #3 and #6, it would facilitate the sharing of knowledge among colleagues since it enables them to share various materials such as video, audio and textual files. Physician #2, #4 and #8 indicated how the mix mode sharing of knowledge can enable the physicians in the community to communicate and share learning materials precisely and rapidly. They considered such tool to be better than MedScape which can be outdated and not directly relevant. MedScape is a Web portal that provides learning resources for physicians and healthcare professionals, and it contains medical

research, articles, news and updates in various healthcare specializations (MedScape 2017) Likewise, physician #5 and #7 expressed that this feature would ease the process of seeking advice from other physicians who are overseas. Physician #7 indicated that when he stated “If there is a tool that can enable me and my colleagues to share different kind of materials like text or recording or videos, it will surely save our time and efforts spent in online searches”. Thus, the utilization of such tool with this feature provides the flexibility of sharing various file formats regarding existing and new medical procedures.

3. Perception on knowing physicians’ participations

Inputs from the eight interviewed physicians indicated how this feature can be useful in supporting their learning and knowledge-sharing activities. For instance, physician #1, #3, #4, #5 and #8 expressed that identifying the physicians’ participation will who to contact when theirs an urgent need to medical consultancy. Physicians in the knowledge-sharing community may share the same medical specialization and years of experience; however, their learning styles and experiencing paths can be vary. The results of this notion are the variance in knowledge level among physicians who are practicing the same medical specialization. This results in the variance of their expertise and experiences. Thus, this feature in the tool can guide them to the physician who is more knowledgeable in certain medical topics and cases. Likewise, physician #2, #6 and #7 indicated that their participation of well-experienced specialized colleagues would help them in locating the relevant and useful knowledge. In this context, physician #2 stated “It will help us to know the expert to contact and the most relevant learning materials to be followed”. Thus, this feature will be beneficial in updating the healthcare knowledge for the physicians by networking with other physicians who are more familiar with certain areas in this specialization. It will help in effectively responding to cases by contacting or discussing with experienced physicians. Additionally, the utilization of this feature will show the interest of each physicians and what they can offer to teach in certain topics related to their medical specialization.

8.3.5 Fifth theme: top management reinforcement

The fifth theme was derived from the analysis of physicians’ responses to questions (E-1, E-2 and E-3). The analysis of the data for this theme is grouped into two themes which are the organizational guidelines for knowledge sharing and physicians’ suggestions to the top management. Physicians’ opinions under this theme were grouped under two codes.

Code 1: lack of guidelines for knowledge sharing This theme represents the analysis of physician’s inputs for the

interview question E1 and E2. Out of the eight interviewed physicians, seven physicians expressed the lack of clear guidelines and programs for encouraging knowledge sharing among physicians. All of these seven physicians indicated the absence of adequate directives and systems for promoting the sharing of knowledge. Physician No.4 stated “unfortunately, in our hospital there are no guidelines or systems in place for circulation of knowledge and smooth flow of information”. Other physicians gave similar remarks when they were asked about the existence of such organizational guidelines and initiatives. Physician No.6 stated “the current initiatives are not effective”. Likewise, physician No.2 stated “there are no activities in doing programs or establishing guidelines for this purpose”.

Code 2: physicians' recommendations This theme of the analyzed data is concerned with the physician's perceptions and recommendations to top management for improving the overall processes involved in the knowledge sharing in the healthcare organization. The phrasing of this question was intended to give sense of ease and flexibility to the physicians when they answer. Physicians' personal perceptions took different forms and suggestions. Physicians #1 recommended the establishing of a digital library that deals with materials related to their specialization with access to reputable medical societies and journals, whereas physician #2 thought that the priority for the management is to set up an adequate system for knowledge sharing to be supervised by the Training and Development department. Likewise, physician #3 suggested the deployment of computerized systems and online tools that has similar capabilities as the one provided by the social media. Similarly, physician #4 recommended the utilization of new technological solutions and programs to encourage physicians to share knowledge easily and rapidly. Alternatively, physicians #5 indicated that management priority and efforts should be focused on establishing a culture of knowledge exchange for topics that are relevant to their field of medical specialization. Physicians #6 advised that top management's supervision is necessary for ensuring the successful launching and implementation of new learning initiatives for the CME (Continuous medical Education). She stated that “Top management in our heart center should continue to support and monitoring the medical staff after the launch of new initiatives for the CME and they should encouraging the staff to use technology more often”. Physicians #7 asserted the need for top management to use lessons learnt from international healthcare organizations specifically in the sharing of medical knowledge. Physicians #8 recommended the top management to send and receive delegations of experienced physicians to improve their understanding of modern of diagnosis and treatment methods as well as the procedures for surgical interventions.

The interviewed physicians expressed their support to the idea of creating new system, programs and guidelines

that encourage the knowledge circulation in the community of physicians. The interviewed physicians indicated their reliance on Medscape Web portal as one of their means of acquiring new knowledge regarding their field of specialization. Medscape is a Web portal that provides learning resources for physicians and healthcare professionals, it contains medical research, articles, news and updates in various healthcare specializations (Medscape 2017). Additionally, physicians' inputs contained several recommendations to the management of their healthcare organizations; they suggested the use of advanced methods and technological means that has been successfully applied in other healthcare organizations in Iraq or abroad.

9 Considerations for successful healthcare knowledge-sharing

The analysis of the data has indicated four critical considerations to be taken into account for the successful healthcare knowledge-sharing activities. These considerations are:

1. Continuous learning of new healthcare knowledge

The ongoing exposure of employees to new medical knowledge is key for successful knowledge-sharing activities. In order to continuously circulate relevant knowledge in the healthcare organizations, the staff need to keep abreast of developments in their medical specialization. This acquaintance with new medical knowledge can be encouraged by the top management through training programs locally and internationally. The learning and sharing of relevant knowledge help the medical staff to perform their duties adequately (Gaál et al. 2014).

2. Evident knowledge-sharing culture

The clear manifestation of knowledge-sharing culture is a requisite for adequate knowledge-sharing activities. The healthcare organization' top management is required to develop policies that ensure the existence of such culture or improve the existing one. The top management is required to ensure that medical staff are communicating their knowledge regularly and transparently for adequate healthcare service delivery (Adolfsson and Aneheim 2016).

3. ICT-supported healthcare knowledge-sharing

The utilization of technological tools is critical for efficient knowledge sharing in healthcare organizations. The utilization of ICT platforms enable medical staff to perform knowledge-sharing activities conveniently. Sharing of knowledge among the medical staff using technological solution assist

them to efficiently conduct the admission, diagnosis, treatment and monitoring of patients (Gebretsadik et al. 2014).

4. Top management involvement

The continuous rigorous involvement of top management is essential for impactful knowledge-sharing initiatives in the healthcare organization. This involvement is necessary for new and existing learning initiatives and knowledge-sharing activities among healthcare organization's staff. The lack for top management involvement causes misinformed medical communities and may cause substandard healthcare services (Hustad et al. 2014).

10 Conclusions and future works

Several conclusions were drawn from the study of the previous literature and the implementation of the research methodology. These conclusions can be outlined in two main aspects which indicate the study's implications that might be relevant to the practitioners and researchers alike.

Firstly, the implications of this research can be assistive to practitioners operating in the field of knowledge sharing in healthcare organizations. The studied literature has indicated a genuine interest by top management in public and private healthcare organizations to establish adequate knowledge-sharing systems. Public and private healthcare organizations are investing in the training and the learning of their staff. Part of their efforts, the top management of healthcare organizations intend to establish a culture of continuous knowledge-sharing and learning. The existence of knowledge-sharing culture equips the medical staff with the relevant knowledge that is needed to deliver quality healthcare services.

Moreover, the study draws attention to the need for additional dedication and investments by the top management in the knowledge-sharing and learning initiatives. The management involvement is essential to make sure of that the knowledge-sharing activities are actually taking place among the communities of the healthcare workers. Practitioners in the healthcare sectors are expected to provide better structures and layouts for effective sharing of knowledge in healthcare organizations. These structures should have the simplicity to be adopted by the employees and the efficiency projected by the top management. Furthermore, the study asserts the critical role of integrating technologies in supporting and facilitating the healthcare knowledge learning and sharing.

Secondly, the implications of this study may be useful in guiding academics who are researching for methods to optimize the learning and the sharing of healthcare knowledge. Additionally, this study provides an empirical support for future attempts in developing models for knowledge sharing

in healthcare organizations. The study's framework and its elements may provide focal points for researchers who wish to improve the acquiring and exchange of healthcare knowledge. The findings of this study can be generalizable to other industries with suitable precautions and customizations. These customizations are related to the type of organizational knowledge, organizational culture status, and extent of top management involvement for the knowledge-sharing environments in those industries. Further research efforts are still needed to realize practical solutions for the issues arisen when dealing with the multifaceted and multidisciplinary field of organizational knowledge-sharing in various industries.

The implications of this study have indicated several ideas that can be considered for future studies especially what relates to:

1. How to organize and index the various types of knowledge in healthcare organizations.
2. The measures followed when sharing knowledge in a medical community of practices.
3. How to build and animate a knowledge-based community of practice in healthcare organizations.
4. How to integrate technology-based tools for the capturing and sharing of knowledge in healthcare organizations.

Appendix 1: interview's questions and aims

Section A: acquisition of knowledge

A-1 Can you please explain how you acquired your medical knowledge starting from your time as a medical student, up until your present position? Can you highlight some of the most significant events during the period of your study at university and afterward as a medical practitioner?

Aim The elicitation of general information regarding the physician's formal educational background and the main milestones in his previous learning backgrounds, starting from his time as a student at the college of medicine up to the date of conducting this interview.

A-2 Besides the aforementioned formal processes of learning, are there any other informal, personal, or organizational means that helped you shape your knowledge required for practicing your occupation? What are these means; can you please clarify?

Aim Provides a description on the informal methods and learning materials involved in shaping the physician's knowledge. It helps in understanding the direct sources of the physician's current knowledge including the formal and non-formal sources of knowledge.

A-3 How do you learn about new topics? Describe the methods or procedures that are relevant to your practice, especially in your area of specialization? Does the healthcare organization you are currently working for provide any programs to facilitate the continuous learning and further development of the latest medical skills?

Aim Exploring the possible activities involved in acquiring new knowledge as a personal learning effort or as set by the hospital management. Furthermore, it inquires on the possible existence of programs for ensuring the continuous learning and skills' development in the healthcare organization.

Section B: people dealing with knowledge

B-1 Does the practicing of your occupation's daily duties require you to interact and coordinate with medical or non-medical staff? Who are those people you interact with and do they aid in the organizational knowledge sharing and improving your knowledge for your medical practice or occupation? If yes, please outline how they assist in the development of your knowledge and improvement of your practice?

Aim To be familiarized with the medical and non-medical staff who are participating in providing sources of information and knowledge to the physician and eventually the provisioning of quality healthcare services.

Probing question What are the organizational departments they are working in? Are some of them more associated with your practice than others? Who are they?

Section C: knowledge sharing culture

C-1 How do you and your colleagues share knowledge regarding a specific topic in your area of specialization? Kindly include the formal and informal settings, if any, where this knowledge is shared, or elaborated upon, with your colleagues?

Aim Explaining in details the knowledge sharing culture among the physician being interviewed and his colleagues. This will provide insight of the actual sharing activities and how the organization supports such knowledge-sharing culture.

Probing question In your opinion, are these settings seem to be effective and sufficient? Why?

C-2 Are there any rules, guidelines, or recommendations promulgated by your organization that encourage the culture of knowledge-sharing among physicians, medical and non-medical staff?

Aim Understanding the healthcare organization's role in establishing a culture that encourages knowledge-sharing activities among the community of physicians practicing

in the same or similar area of specialization as well other medical or non-medical staff.

C-3 In your opinion, what can be done to improve or establish an effective knowledge sharing culture among physicians, other medical and non-medical staff?

Aim From the physician's own experience and viewpoints, suggesting ways to improve or establish an effective knowledge sharing culture among physicians and other medical and non-medical staff.

Section D: ICT-supported knowledge management

D-1 How do you react when you come across a new medical case or a new detail in an existing case, which you have not studied, or experienced before? How do you decide the best course of action to take, when faced with such cases?

Aim To understand the physician's personal behaviors and reactions when faced with new medical cases that might require new type of medical knowledge. Realizing that will aid in understanding the way the physicians decide on the relevancy of his or her current knowledge versus the new knowledge that he or she needs to acquire. The probing question inquires on the existence or non-existence of ICT tool that supports the physician in new medical learning or observations.

Probing question Are there any technological means or tools that support you in learning about new cases or review current or previous cases?

D-2 How do you perceive collaborative learning through a Web-based environment as an alternative to traditional face-to-face knowledge-based sharing sessions? What Web-based sites have you used or have you heard about?

Aim To provide description on physician's opinion on having an ICT system in place that can support the knowledge-sharing activities in the healthcare organization.

D-3 How would you and your colleagues make use of the availability of a mixed mode of knowledge-sharing media such as: videos, wikis, blogs, Skype, and social network sites to trace experts for specific area? Please outline any you have heard about, or might have utilized in your practice for the medical knowledge sharing?

Aim To explore the viewpoints of physician on the existence of effective technological tool which can facilitate the knowledge sharing from mixed resources in order to learn about specific topic.

D-4 How would knowing one's participation in Web-based collaborations be useful for enhancing knowledge sharing, among members of knowledge sharing community?

Aim To express physicians' thoughts on the usefulness of knowing who is doing most of the knowledge sharing within the community of physician regarding a certain topic.

Section E: top management reinforcement

E-1 How does the top management motivate the hospital's personnel to maintain an environment of knowledge-sharing for the type of knowledge that is necessary for delivering quality of healthcare services? How does this link to the values and morals of the employees in this hospital, including you?

Aim To discover the approaches followed by the hospital top management in promoting a knowledge-sharing environment among the employees and how that helps in spreading high work morale among them.

E-2 How does the top management of your healthcare organization ensure a smooth flow of knowledge and adequate communications among the physicians, medical staff and non-medical staff? Are there any guidelines or systems in place for this purpose?

Aim To understand the role of top management in emphasizing on the availability of valuable knowledge to the hospital staff in order to equip them with better means to efficiently react to new medical cases admitted in their healthcare center.

Probing question What is your opinion on the top management's initiatives and guidelines especially what relates to the knowledge management in the hospital, if any?

E-3 Finally, can you suggest or recommend how the communication of knowledge can be improved, or be made more effective, in your current practice, work place or for any other healthcare organizations that you have studied, or worked for, in the past?

Aim To obtain any possible recommendations thought by the physician for improving the overall status of knowledge management and knowledge sharing in the healthcare organization.

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