The Impact of Tacit Knowledge on Perceived Performance of Doctors in a Chinese Hospital

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Abstract

It is generally agreed that tacit knowledge is a valuable resource of organisation to sustain competitive advantage. Researchers have linked it to improved performance in business management, academic area, psychology and military leadership. However, little research has been done in investigating the relation between tacit knowledge and performance in the medical sector. Once a positive effect of tacit knowledge on medical performance has been found in the healthcare sector, it will make medical graduates or novices aware of the importance of practical learning. Moreover, HR managers in the healthcare can design effective training programs for doctors and nurses based on the link between tacit knowledge and performance. Last but not least, how to create a working environment with knowledge sharing atmosphere is beneficial to a learning organization.

This research takes a quantitative approach to examine the relation between tacit knowledge and perceived performance among medical staff. Four hypotheses are proposed pertaining to three components of medical tacit knowledge. Furthermore, a tacit knowledge scale of 14 items is developed to be distributed to the target sample (expert and novice) with 30 responses. The self-reported position is the only measure for perceived performance of participants, with the assumption that experts perform better than novices. All hypotheses are tested with some supported and some not. The present study also analyzes collected data and discusses the meaning of the result. Practical implications for medical and HR workers are presented.

By clarifying the relation between tacit knowledge and performance, managers and HR employees in healthcare sector can get a better understanding of excellent medical human resources and the nature of medical knowledge sharing, changing the hospital into a learning organization. Tacit knowledge is deeply rooted in people's mind. Therefore, managing tacit knowledge is managing people. The paper bridges the gap in the literature of the effect of tacit knowledge on doctor's performance and has practical implications for HR and relative managers to encourage knowledge sharing and creating a learning organization.

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Introduction

In modern society, organisations try to gain and sustain competitive advantages by maximizing resources they possess, namely, by managing assets (Thoene and Buszko, 2014). There are two kinds of assets in organizations: tangible assets and intangible assets. As to tangible assets, most organizations recognize how important it is to introduce new technology and to improve facility. However, in terms of intangible asset, organizations do not pay enough attention to the importance, utilizing and management of it (Fang and Zhang, 2014). The main area that organizations ignore is knowledge, especially tacit knowledge (Thoene and Buszko, 2014).

Tacit knowledge is a concept compared with explicit knowledge. People acquire tacit knowledge from experiences rather than books, which means that tacit knowledge is a practical intelligence hard to articulate. Tacit knowledge is of key importance to medical staff, whose professional level is to a large extent depended on experiences and competencies developed in the practice (Thoene and Buszko, 2014). Many hospitals try to attract medical experts by paying high salary to them. The benefits brought by experts to the hospital are originated in their knowledge, both explicit knowledge and tacit knowledge, with the former easy to be transferred and stored and the latter not (Nonaka, 1995). In addition, for individuals, tacit knowledge can only be acquired and accumulated from numerous practices.

While the concept of explicit and tacit knowledge has been widely accepted, the impact of tacit knowledge on working performance does not receive much attention (Fang and Zhang, 2014). Nevertheless, Sternberg, Forsythe and Hedlund et al. (2000) suggest that tacit knowledge is a good predictor for career success. Most of existing research on tacit knowledge is mainly carried out in the area of psychology (Theone and Buszko, 2014). Research on tacit knowledge in business management focuses on how to utilize it to help organizations to achieve competitive advantages (Wigg and Jooste, 2003). In addition, there are few papers pertaining to tacit knowledge in medical area. Therefore, making clear the link between tacit knowledge and perceived performance in medical environment and

how to manage and optimize tacit knowledge are quite significant to the development of hospitals and future research.

This dissertation aims to address this gap by investigating the relation between the tacit knowledge and perceived performance in medical area. It is expected that (1) a comparison of expert and novice on tacit knowledge be presented; (2) the correlation of tacit knowledge and perceived performance be found.

As less scholars try to quantify and measure tacit knowledge in medical environment, the aim of this thesis is to explore how tacit knowledge affects perceived performance of doctors. This dissertation will contribute to the knowledge management and training and development field of human resource management (HRM), especially maximizing tacit knowledge resources, promoting the sharing of knowledge in the organization, providing insights to human resource managers in

medical sector. For HR managers in hospital, organizing and designing training programs of doctors and nurses are one of their main job responsibilities. Therefore, understanding the relation between tacit knowledge and performance can help HR managers to tap into the potentials of doctors, especially new comers, and improve the quality of medical services and the reputation of hospitals. With a clear relevance of tacit knowledge and performance, HR managers of medical sector can inspire novice to communicate with and learn from experienced specialists, and encourage experts to share tacit knowledge with novice, creating a learning environment to win competitive advantages.

The paper is structured in four parts, introducing firstly the big context of tacit knowledge research and its significance to the practical world; then, a discussion of the tacit knowledge framework and relevant theories and concepts will be given; next, data collection procedure will be presented; in the fourth part, the researcher will analyze the results, test the hypotheses and draw the conclusion; last but not least, the contributions to the empirical world, limitations of this study and suggestions for future research will be discussed.

Literature Review

Literature on the tacit knowledge has expanded over the last number of years, predominantly since the work of Wagner (1987), Sternberg et al. (2000) and Nonaka (1994). However, most research is aggregated in psychology, management (Wagner, 1987), military leadership (Hedlund, Forsythe and Hhorvath et al., 2007), and academic area (Insch, McIntyre and Dawley, 2008). In healthcare sector, research on tacit knowledge has been focused on medical education and pharmaceutical industry. McLeon, Steinert and Meagher et al. (2006) design a questionnaire of multiple-choice questions requiring procedural knowledge and test medical teachers. They conclude that all participants score high on these questions, but those with education high degrees perform best (MaLeon, Steinert and Meagher et al., 2006). Thoene and Buszko (2014) highly evaluate the important role of tacit knowledge in pharmaceutical industry and present a quantitative model of interaction among organizational efficiency, capital, technology and tacit knowledge. They contribute to tacit knowledge research in that they show the value of tacit knowledge in pharmaceutical firms and present a quantifiable framework. They even contend that tacit knowledge is fundamental to the survival of pharmaceutical company which is highly knowledge-based (Hyondong and Yaping, 2009).

In this part, there are four sections. In the first section, the origin of general knowledge concept will be traced back; in the development of knowledge's definition, two types of knowledge gradually are differentiated by scholars, namely explicit knowledge and tacit knowledge. Next, a specific review to definition of tacit knowledge will be discussed. In the third section, the importance of tacit knowledge on performance will be introduced. Lastly, Wagner's (1987) tacit knowledge framework will be explained, which is the theory model of this study.

The definition of general knowledge

In organizational context, controversy among scholars about how to define 'knowledge' has been existed over a number of years (Newell, Robertson, Scarbrough and Swan, 2009). Knowledge has been defined in a number of ways as

shown in the table below.

Definitions of knowledge	Related references
A dynamic human process of justifying personal belief toward the "truth"	Nonaka and Takeuchi (1995)
The dynamic and smooth flow of specialized experiences, values and insights.	Davenport and Prusak (2000)
Internalized information which is integrated within person's cognitive structures	Segundo (Segundo, cited in Teece, 2001)
A set of conceptual structures held in human brains.	Zins (Zins, cited in Teece, 2001)
The human expertise stored in a person's mind, gained through experience, and interaction with the person's environment	Brodie and Brodie, cited in Leiw (2013)
1. Cognition or recognition (know what) 2. capacity to act (know-how) 3. understanding (know-why) that resides or is contained within the mind or in the brain.	Liew (2013)

(Table 1)

In the table above, knowledge is defined by scholars from two points of view: cognitive and practical. Scholars who emphasize cognitive part of knowledge propose that knowledge is a set of concepts or information stored in human mind, as Segundo and Zins (Teece, 2001), while those who highlight the practical aspect of knowledge indicate that knowledge is about experiences, insights and know-how, like Davenport and Prusak (2000). The differences in the views of knowledge reflect the differentiation between 'epistemology of possession' and 'epistemology of practice' in early ages (Cook and Brown, 1999). Scholars who held this view

contends that the accumulation of knowledge is like a pyramid, composed of wisdom on the top, knowledge and information in the middle and data in the base (as shown in Table 2). In Ackoff's original figure, it is a hierarchical pyramid (Ackoff, cited in Newell, Robertson, Scarbrough and Swan, 2009). To summarize, the epistemology of possession compares knowledge as a thing possessed by people, it is like belongings of a person (Cook and Brown, 1999). In contrast, the epistemology of practice suggests that knowledge is only meaningful when used by people in practice.

10%	Wisdom
20%	Knowledge
30%	Information
40%	Data

(Table 2)

From the table 2 above, it can be suggested that knowledge is composed of four elements, namely, data, information, knowledge and wisdom. In this view, knowledge is one's possession, which can be passed from one person to others (Cook and Brown, 1999). The epistemology of possession stresses more cognitive part of knowledge, which is like wealth of a person (Cook and Brown, 1999). Knowledge can be accumulated, used and shared by people (Cook and Brown, 1999).

However, the 'epistemology of practice' argues that knowledge is created and developed in practices. Knowledge is coexisted with the work people actually do, rather than a thing outside the job people do (Newell, Robertson, Scarbrough and Swan, 2009). For example, a person who wants to become a good driver cannot just read manuals about how to drive and accumulate driving tips in the classroom. It is better for him to learn by driving a real car and reflecting on how to drive in practices. The same rationale can be applied to chefs, carpenter, repairer, pianist and language learners.

The salient contribution made by Nonaka (1994) to the research on knowledge is that he found the dynamic nature of knowledge, in contrast with traditional view regarding knowledge as static and absolute. In Nonaka's view, knowledge is rooted in the social interactions (Nonaka, 1994). Therefore, Nonaka and his colleague (1995) describe 'knowledge' as 'a dynamic human process of justifying personal belief toward the "truth"' (Nonaka and Takeuchi, 1995, p.15). The three features of knowledge are dynamic, humanistic and relative (Nonaka, 2001). The concept of 'context' plays an important role in knowledge, because context changes irrelevant data into knowledge (Nonaka, 2001). For example, 'Dublin' is just information. However, when it is put into a context, 'Dublin is the capital city of Ireland', it becomes a specific knowledge. In addition, knowledge is meaningful when it is used by people. "Information becomes knowledge when it is interpreted by individuals and given a context and anchored in the beliefs and commitments of individuals" (Nonaka, 2001, p.15).

From the table1, it can be found that Leiu (2013) combine the two views and also add a 'know-why' dimension to the definition of knowledge. As knowledge is dynamic suggested by Nonaka (1994), people in different times define it from different perspectives. Leiu's (2013) definition to the knowledge is the latest version and the most complete one. Therefore, in this research, the writer chooses Leiu's (2013) definition of knowledge. Moreover, as knowledge is closely associated to the context and the research setting of this paper is medical area, Leiu's (2013) definition to knowledge is more suitable, because doctors not only need to grasp abundant theories of diagnosis and store them in their mind, but also learn to improve medical skills from large number of practices, which is more important to good performance. What the author means to 'knowledge' in this paper includes three aspects: know-what, know-how and know-why, in other words, cognition, act and understanding.

As stated above, scholars are divided on the definition of knowledge, mainly concentrating on the debate about whether knowledge is possessed by knower (cognitive view) or presented in the practice (practical view). Nonaka (1994)

assumes that knowledge has two types: explicit knowledge and tacit knowledge. To some extent, explicit knowledge is similar to cognitive knowledge and tacit knowledge means practical views. To make it clear, the author made a table (Table 3) to show the similarity of these concepts as follows. Nonaka's (1994) differentiation between explicit and tacit knowledge is a widely accepted concept in knowledge management field. According to him, explicit knowledge is knowledge which can be articulated (Nonaka, 1994). People can describe this kind of knowledge in formal and systematic language (Nonaka, 1994). Explicit knowledge includes data, scientific formulas, books, manuals and so on, which can be stored and transferred easily (Nonaka, 1994). In contrast, tacit knowledge is knowledge which is very hard to speak out (Nonaka, 1994). He also creates knowledge conversion framework, focusing on the interaction and expansion of two types of knowledge.

Epistemology of possession	Epistemology of practice
Cognitive aspect	Practical aspect
Explicit knowledge	Tacit knowledge

(Table 3)

As to other classifications of knowledge, Mac Loop in 1994 classified knowledge into 5 more detailed types: practical knowledge, mental knowledge, amusement knowledge, abstract knowledge and ordinary knowledge. In organisations, knowledge is hidden in documents, reports, files, procedures, norms and even values (Andreeva and Ikhilchik, 2011). Rumer (2003) proposes that knowledge is one of human capacities, the endless source of power, which through more applying, it can expand in volume and depth (Rumer, 2003).

The definition of tacit knowledge

The earliest statement about tacit knowledge is from Polanyi, "we can know more than we can tell" (Polanyi, cited in Johan and Engel, 2008, p.185), which best

shows the feature of tacit knowledge, but Polanyi does not explicitly mention 'tacit knowledge'. As a pioneer in this research area, he regards tacit knowledge as an unspeakable knowledge stored in the mind.

Sternberg et al. investigate the content of tacit knowledge by designing simulated working scenarios and asking participants to rate possible choices (Sternberg et al., cited in Insch, McIntyre and Dawley, 2008). Tacit knowledge is defined by them as practical intelligence, which is "action-oriented knowledge, acquired without direct help from others, which allows individuals to achieve goals they personally value" (Sternberg et al., cited in Insch, McIntyre and Dawley, 2008, p.562).

Wagner (1987) indicates that tacit knowledge is know-how. He further outlines three aspects of tacit knowledge: managing oneself, managing tasks, and managing people (Wagner, 1987). Self-management is composed of two areas: self-motivation and self-organization skills; managing tasks is knowing one's work well and understanding the big picture one's work sitting in; managing others is to deal with different relationships with other people, including subordinates and peers (Wagner, 1987). Finally, he contends that tacit knowledge increases with the age of experiences and plays a significant role in one's job performance.

Nonaka (1994) defines tacit knowledge as "the valuable and highly subjective insights and intuitions that are difficult to capture and share because people carry them in their heads" (Nonaka, 1994, p.162). It is deeply rooted in people's brain, including intuition, skills, subjective insights, routines, values and commitment (Nonaka, 1994). It is very personal, which means that people can only grasp it in practices and hard to transfer it to others in languages (Nonaka, 1994). It is knowledge about 'how' rather than 'what'. In a word, tacit knowledge is a concept that is far beyond the recorded data and information, involving the mind–sets of societies and work processes and practices. The sources of tacit knowledge are mental models, values, beliefs, perceptions, assumptions and concepts (Nonaka, 1994).

Some scholars use 'practical intelligence' (Toffler. 1990) to substitute for tacit

knowledge. Pactical intelligence is an individual's ability to adapt to working environment and shaping the environment in order to achieve personal goals (Fang and Zhang, 2014). Moreover, to understand the practical intelligence from the viewpoint of knowledge, Sternberg et al. (2000) indicate that knowledge which is relative to solving problems is characterized as tacit.

Tacit knowledge includes skills and competencies (Johan and Engel, 2008). Agbim, Owutuamor and Oriarewo (2013) also agrees that tacit knowledge is deeply stored in people's mind, also, they also think that it involves individual skill and competency (Agbim, Owutuamor and Oriarewo, 2013). Tacit knowledge only manifests itself in the application (Leonhard and Sensiper, 1998). While explicit knowledge "identifies the object itself," tacit knowledge presents the knowledge of "how it happened" (Thoene and Buszko, 2014, p.42). Sternberg et al. (2000) summarize three features of tacit knowledge: (1) it is acquired mainly in the practice; (2) it is procedural with the form of 'know how' instead of 'know what'; (3) it is significant for achieving one's goals. Beverly (2003) further indicates that tacit knowledge is informal instead of formal and generally not directly taught (Beverly, 2003).

In this research, Wagner's (1987) definition of tacit knowledge is used, namely, tacit knowledge is about managing self, managing others and managing tasks, because it not only contains cognitive dimension as beliefs, values and insights, but also incorporates technical dimension, like 'know how'. In addition, the social interaction is also considered. As healthcare sector not only involves of scientific knowledge, but also includes tricky skills in the practice as well as social interactions. Wagner's (1987) definition of tacit knowledge is overall, in accordance with necessary skills of doctors in the medical situation.

The importance of tacit knowledge on working performance

Previous studies show that tacit knowledge is one of effective measures in the workplace to distinguish between good and poor job performance (Andreeva and Ikhilchik, 2011). Research on managers' tacit knowledge found that tacit knowledge

is often used in solving problems in a specific context (Armstrong and Mahmud, 2008). These problems are complicated with no standard answers in books to consult. To find the solutions, managers need to integrate their experience, skills, thoughts and values (Armstrong and Mahmud, 2008). The greater the managers' success, the more abundant the tacit knowledge they have (Armstrong and Mahmud, 2008).

Research on the effect of tacit knowledge has been conducted in psychology, management, military leadership and sales industry (Sternberg Forsythe and Hedlund et al., 2000). Existing evidence has shown that tacit knowledge contributes to management effectiveness, leadership effectiveness and team performance (Ryan and O'Connor, 2009). In the work, those experts and managers are regarded as people who have more tacit knowledge in specific areas (Inschm McIntyre and Dawley, 2008).

Despite increasing evidence showing that tacit knowledge is positively linked to better performance in the work, little reserch has been conducted in medical environment. Johan and Engel (2008) notice a change in medical course reform and give credit to the importance of tacit knowledge in diagnosing process for medical novices after a reform decreasing the hours of postgraduate medical education and increasing the time of internship in actual hospitals is carried out in Denmark (Johan and Engel, 2008). The reform is initiated due to a growing recognition among medical teachers that the very nature of medical knowledge is not just cases, clinical guidelines and courses. Instead, it is acquired from endless experiences (Johan and Engel, 2008). If medical students are just presented to courses, they can reach the expert level the moment they are graduated from the college.

Empirical evidence of tacit knowledge's influence has also been found in some studies. For example, Sternberg, Forsythe and Hedlund et al. (2000) examines tacit knowledge among students and concludes that excellent school performance not only requires knowing knowledge in books but also needs practical skills, like knowing how to get an ID card and how to borrow books using automatic book machines. Somech and Bogler (1999) also investigate tacit knowledge in academic environment and develop the empirical research of Sternberg et al., contending that

good-performed students have more tacit knowledge than those who are less successful students in the school tests.

However, the role of tacit knowledge in medical environment is also controversial in the literature. Goldman (1990) disagrees with the view that tacit knowledge plays a substantial role in doctor's mental judgment, rather, clinical judgment is fully an explicit process based on abundant theories learned. Tsokas (2002) even do not agree with the conception of 'tacit knowledge'. He contends that tacit knowledge should not be separated from explicit knowledge, both of which are two sides of the same coin (Tsokas, 2002).

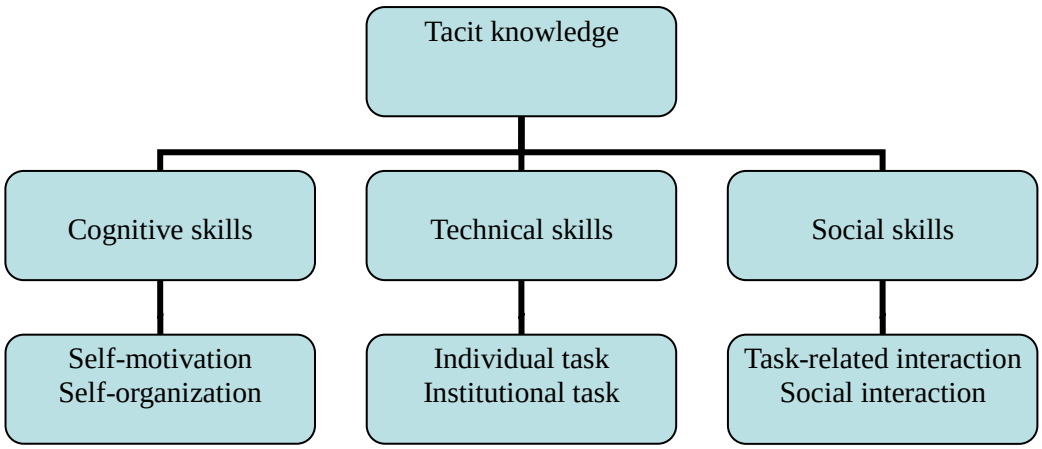
As the development of information technology and the increasing number of hospitals, competition is more intense than that in the past, the obligation to adjust to new and dynamic competitive conditions compel hospitals to exploit its internal resources, namely, tacit knowledge owned by experts, and to encourage the sharing of it among all doctors, in this way, tacit knowledge can be utilized completely (Papatya and Papatya, 2005). Besides being a public service organization, hospital should be transformed into an institution that continuously generates knowledge to keep up with the updating of medical science (Thoene and Buszko, 2014). The benefits of utilizing tacit knowledge are also reflected in its nature of being hard to imitate (Papatya and Papatya, 2005). It is difficult to imitate and cannot be substituted with unique characteristics. Therefore, when a hospital has tacit knowledge, it is hard for other competitors to imitate. Tacit knowledge can change into competitive advantage.

Discussion on Wagner's (1987) tacit knowledge framework

Wagner (1987) studies the scope of tacit knowledge. He indicates that tacit knowledge is about managing oneself, managing others and managing tasks (Wagner, 1987). Managing self refers to motivate oneself and organize oneself in work situations. For example, in the work environment, we all have dislike tasks and tend to procrastuinate them to tomorrow, how to overcome these psychological barriers involves skill of self-management (Wagner, 1987). Tacit knowledge of

technical skills is knowledge about how to perform work-related tasks well and quickly. Tacit knowledge about managing others is to know how to manage one's subordinates and getting along well with other colleagues (Wagner, 1987). For example, when you are a project manager and one of your subordinate works very hard, whether you reward the subordinate and how you reward may have an effect on working performance (Wagner, 1987).

Wagner (1987) creates the framework of tacit knowledge based on cognitive schemas theory as in the graph below.



1. Self-motivation skills are tacit knowledge of understanding how to energize, direct and sustain positive attitudes and behaviors toward achieving one's goals (Wagner, 1987). In the work, employees need to perform job tasks with an active mind, which may be demonstrated in following aspects: coming early in the morning, working more diligently, staying late and overcoming difficulties in the job (Ryan and O'Connor, 2009).

2. Self-organisation skills are to arrange work and life flexibly and keep good habits (Wagner, 1987). For example, in the academic environment, some students may find they are highly-efficient in the morning and need a break every one hour to keep concentrated; in the medical environment, medical staff needs to deal with the relation between work and life (Beverly, 2003).

Other scholars also find the importance of cognitive skills. Arzensek (2012)

suggests that knowledge is the result of interaction between the receptor and the environment. As Polanyi said, “all knowing is personal knowing” (Polanyi, cited in Johan and Engel, 2008), all knowledge acquired is processed by the knower himself, no matter in the form of mental process or physical process. Johan and Engel (2008) further point that this does not mean that knowledge is subjective, instead, both intellectual and practical knowledge is closely associated with the person. Therefore, cognitive and psychological skill plays an important role in the process of acquiring knowledge. According to Polanyi (1966), to become knowledgeable and competent, we need to perform not only tasks in the environment, but also act within ourselves. This is the cognitive part of tacit knowledge in the work. Thoene and Buszko (2014) also suggest that personality and cognitive ability affect performance in the workplace (Thoene and Buszko, 2014).

3. Individual technical skills are to know steps in a working procedure, including how to operate machines, how to finish a specific project step by step and how to expertly perform jobs (Wagner, 1987).

4. Institutional technical skill is to fit individual work into the big picture of the organization (Wagner, 1987). The successful performance of the whole organization requires the cooperation between different departments.

5. Social skill is to deal with the relations with colleagues, subordinates and leaders (Wagner, 1987). Insch, McIntyre and Dawley (2008) also suggest that social skill is significant to good working performance. Hence, it should receive much attention when discussing about tacit knowledge. In social aspect of tacit knowledge, Dhanaraj et al. (2004) is an outstanding researcher who specifically focuses on researching the role of social ties and trust in transferring tacit knowledge. Social knowledge is a very important component of tacit knowledge positively associated to academic performance among graduate students (Edwards and Schleicher, 2004). Tschannen and Nestor (2004) found that cooperation and support among scholars are good for them to achieve academic goals (Tschannen and Nestor, 2004).

According to Wagner (1987), there are two components of social skills: task-related social interaction and general social interaction (Wagner, 1987). As to task-related social interaction, novices always need to learn from experts with

enough experiences, usually mentors or supervisors, to quickly get familiar with the job procedure and overcome initial difficulties in the work. It is especially important to novices to know whom they can turn to for useful advice related to the job tasks (Pitt and MacVaugh, 2008). Understanding the hierarchy of company and getting along well with expert in the relative working area are helpful to novice to improve working performance (Wagner, 1987). In medical area, social tacit knowledge is to identify a senior mentor in relative working areas and to learn from the mentor; or to actively participate in seminars and meetings to share working experiences with others (Johan and Engel, 2008).

In terms of the second aspect of social tacit knowledge, general social interaction skill is to understand information that is not directly related to job tasks but relative to working environment and company (Wagner, 1987). For example, participating annual new year party and a trip may help employees to get know more about their colleagues and the situation of their organization (Beverly, 2003). In medical environment, social activities like medical knowledge match and annual summer trip may be beneficial to doctors and nurses to increase general understanding of hospital.

A good medical performance is dependent on many different and interacting factors like effective plans, good communication and clear goals. Faraj and Sproull suggest that human factors can be critical to the working performance even outweighing the role of technological developments (Faraj and Sproull, cited in Pitt and MacVaugh, 2008). Particularly, in team works, the internal relations between team members including the communication and interaction among them are closely related to the successful projects (Guinan et al., cited in Ryan and O'Connor, 2009).

To summarize, the differentiation between explicit and tacit knowledge exists from the debate on defining knowledge; Polanyi at first puts forward the concept of 'tacit knowledge' (Polanyi, cited in Johan and Engel, 2008). Tacit knowledge is positively related to working performance. Wagner's framework of tacit knowledge contains three aspects on the basis on cognitive schemas.

Research Questions

Current research on tacit knowledge has been conducted in investigating the impact of tacit knowledge in academic, military and managerial environment (Sternberg et al., 2000). There is little evidence in medical sector, despite the fact that practical knowledge plays an important role on the overall performance of doctors and nurses. In order to fill the gap in the literature, this research aims to investigate the effect of tacit knowledge on the perceived performance in medical sector.

Based on the aim of this research, two research questions are put forward.

Generally, in Chinese hospitals, doctors who are in expert level are perceived to be better performed in their medical tasks compared to novices. Wagner (1987) contends that in academic psychology, tacit knowledge scores increase with increasing years of experience (Wagner, 1987). Krupinsky (2006) compares the differences between expert and novice on visual diagnosis skill in pathology, and concludes that the novice often "focal search" (Krupinsky, 2006, p.186) compared to the expert's use of "global expression" (Krupinsky, 2006, p.186), with the former an intuitive mode and the latter more deliberate. Johan and Engel (2008) also contrasts medical expert and novice on diagnostic reasoning and find that cognitive process of expert is fast, automatic and unconscious, while cognitive process of novice is slow and deliberate (Johan and Engel, 2008). Therefore, the first research question in this study is stated as follows.

Research Question 1: Whether there are significant differences between expert and novice on tacit knowledge level?

In order to find out the relation between tacit knowledge level and perceived performance in medical area, the second research question is presented as follows.

Research Question 2: Whether tacit knowledge level is associated to the perceived performance of medical workers?

As tacit knowledge has three components, cognitive skills, technical skills and

social skills (Wagner, 1987), the researcher puts forward three hypotheses for research question 1.

Hypothesis 1: There is a significant difference between expert and novice on cognitive skills, including self-motivation skill and self-organisation skill.

Hypothesis 2: There is a significant difference between expert and novice on technical skills, including individual technical skill and institutional technical skill.

Hypothesis 3: There is a significant difference between expert and novice on social skills, like task-related social skill and general social skill.

For research question 2, the hypothesis is shown below.

Hypothesis 4: Tacit knowledge is correlated to the perceived performance in medical environment.

Methodology

The research on tacit knowledge has gained popularity in a number of years, since it is regarded as an important component to organizational competitiveness (Fernie et al., cited in Ryan and O' Connor, 2009). Although Polanyi at the first time introduced the concept, how to measure it and what effect of tacit knowledge on performance remain problematic in the academic area. In this part, the reason of choosing quantitative questionnaire as data collection tool, review on method used by scholars on measuring tacit knowledge, detailed information of samples, and six measures are explained one by one.

The purpose of this research is to investigate tacit knowledge in medical environment. Therefore, the target sample is doctors working in the hospital. The objective is to investigate the effect of tacit knowledge on perceived performance in medical environment, in other word, the relation between tacit knowledge and perceived performance. The research philosophy of this research is positivism. Positivism thinks that natural world is objective, and the researcher is independent of and neither affects nor is affected by the subject of the research (Saunders, Lewis and Thornhill, 2009). Therefore, the research process is deductive in nature.

A number of methodologies are available to measure tacit knowledge, like case study, survey, archival research and interviews. However, interview is suitable to exploratory research that requires large number of open-ended questions (Saunders, Lewis and Thornhill, 2009). This study is an explanatory research that attempts to establish causal relationships between variables. In this study, the dependent variable is perceived performance of doctors and independent variable is tacit knowledge level. Hence, interview is not appropriate for this research. Archival research requires access to administrative records or documents, suitable for research questions focusing upon the past and changes over time. It is hard for the researcher to get access to these documents. Therefore, it is not realistic for this research.

Nonetheless, survey is usually related to deductive research, allowing the researcher to collect quantitative data for descriptive and inferential analysis

(Saunders, Lewis and Thornhill, 2009). In addition, most existing research on tacit knowledge adopts quantitative method to collect data. In the previous research, Sternberg et al. (2000) design a series of scenarios similar to actual working situation to test tacit knowledge level by allowing participants to rate possible choices. Ryan and O'Connor (2009) take both quantitative and qualitative methods to measure tacit knowledge in software area, developing the Team Tacit Knowledge Measure (TTKM). At first, they conduct unstructured interviews to three experts for construing items, asking experts to talk about situational factors that they feel are significantly influence the result of projects. In this way, constructs are categorized and initial scale is created. Then, they validate this scale by making a comparison between experts and novices. Lastly, questionnaires are distributed to graduate students, novices and other experts. Beverly (2003) measures tacit knowledge among medical students with the instrument of The Tacit Knowledge in Medical Education Test. Similarly, Insch, McIntyre and Dawley (2008) conduct a research to examine the impact of tacit knowledge on academic performance of students. They design a questionnaire to test students' tacit knowledge, composed of six measures in total, namely, self-motivation, self-organisation, individual technical skill, institutional technical skill, task-related social skill and general social skill. Also, they use self-reported GPA as the indicator of academic performance (Insch, McIntyre and Dawley, 2008). After reviewing the methodologies used by key authors in measuring tacit knowledge, the researcher takes a quantitative approach in the form of structured questionnaire to answer research questions. The questionnaire in this research is designed on the basis of Insch, McIntyre and Dawley (2008)'s items in the Academic Tacit Knowledge Scale. Six measures in the questionnaire are the same as theirs, but with some modifications on each item. Concrete items will be listed hereinafter. The questionnaire is appended behind the thesis. The reason of choosing these two measurement scales is that firstly, they design the scale after interviewing experts and novices respectively; moreover, their questionnaires are in accordance to the cognitive schemas of Wagner (1987), which is the theoretical framework of this research. In other words, this research is based on the same theories as their research on tacit knowledge.

Population and sample

The hospital concerned is a private institution with 151 staff in total. In this August, 40 questionnaires are sent to experts, sub-experts and novices respectively via email. 30 participants reply the email and send back the questionnaire. The response rate is 75%. The sample is randomly chosen from different departments in the hospital, 19 males and 11 females. Among them, 12 participants are experts aged from 45 to 55, except for two experts aged respectively 33 and 34. 15 participants are novices aged from 30 to 44. Experts are those working in a specific medical area for more than 15 years, while the experience of novice is less than 5 years.

The departments of samples

Department	Number of participants
Surgical department	10
Cardiology department	5
Bone and joint department	2
Dental department	3
Department of emergency	6
Department of Chinese medicine	4

The position of medical workers	The number of participants
Expert	12
Sub-expert	3
Novice	15

The researcher consults to a surgical expert in the hospital about practical knowledge in medical area and asks him to check questions in use. At first, a brief introduction of the aim of research and the framework of tacit knowledge is presented to the expert by email. Then, the researcher asks the expert what factors

are related to excellent medical performance in the three aspects of tacit knowledge. Based on the tacit knowledge model developed by Insch, McIntyre and Dawley (2008), and the consultation of surgical expert, the researcher designs 14 items related to medical tacit knowledge. We translate the questionnaire from English to Chinese and send it to volunteered participants by email.

Measures

In the questionnaire, all measures are tested by using a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree) or from 1 (Never do it) to 5 (Always do it). Participants are asked to rate the possible answers.

In Insch, McIntyre and Dawley's (2008) measures for self- motivation, they use items of "complete homework on time" and "willingness to learn" to test. Based on their items, cognitive self-motivation in this research is measured by items "I can complete working tasks on time, for example, finishing the record of patients"; "I have clear goals in my career" and "I love my job even though I feel tired after a day's work". These two items are designed to test the ability to motivate selves and work toward goals. Cronbach's alpha of this measure is .718.

Reliability Statistics

Cronbach's Alpha	N of Items
.718	3

In Academic Tacit Knowledge Test (Insch, McIntyre and dawley, 2008), self-organisation skill of students is accessed by "join study groups" and "self-control ability". In this research, cognitive self-organisation is measured by two items: "I regularly go to work on time"; and "I can distribute my time appropriately including time to diagnose and time to write patient's records". The Cronbach's alpha of cognitive self-organisation measure is .751.

Reliability Statistics

Cronbach's Alpha	N of Items
.751	2

Individual technical skill is measured by following four items. “I set regular time to check the situation of my hospitalized patients, like taking temperature in order to be aware of abnormal situation”; “I meet regularly with the head of my department for advices”; and “I can deftly use computers to make prescriptions”. The researcher accesses institutional tacit knowledge by designing items which measure medical staff’s understanding of how their working tasks fit into the whole medical setting. Items are “I am willing to attend meetings about future medical reforms and learn up to date medical policy trend of the state” and “I ask questions and speak in the meeting”. Cronbach’s alpha of technical skills is .797.

Reliability Statistics

Cronbach's Alpha	N of Items
.797	4

In Insch, McIntyre and Dawley’s (2008) research, task-related social tacit knowledge is accessed through students’ attitudes toward using social channels to improve academic skills. Their items are “listen to recommendation” and “join study groups”. Task-related social interaction in this research is accessed by items of “I get involved in the group discussion about difficult diagnosis”, “I am willing to participate in the nation-wide medical seminars and meetings” and “I participate the nation-wide seminars of in my working area to listen to the lectures of famous experts”. Cronbach’s alpha of task-related social interaction skills is .740.

Reliability Statistics

Cronbach's Alpha	N of Items

.740	3

Insch, McIntyre and Dawley (2008) test students' general social knowledge by designing items not directly related to academic tasks but activities on campus. General social interaction in this study is accessed by attitudes to extra work activities and the relation with peers. For instance, "I am willing to spend other time with my colleagues to relax ourselves" and "I can get along well with my colleagues". Cronbach's Alpha of this measure is .642.

Reliability Statistics

Cronbach's Alpha	N of Items
.642	2

Analysis

For the first research question, whether there are significant differences between experts and novice doctors, an independent T-test is used to analyze data through SPSS. The purpose of independent T-test is to test if the mean of two samples are significantly different from each other (Lambert and Darcy, 2014). If p-value is less than 0.05 we suggest that there is a significant difference between the two groups (Lambert and Darcy, 2014). In addition, Beverly (2003) conducts a research among medical graduate students and experts to test if there is a significant difference on medical tacit knowledge test between these two groups. He adopts an independent T-test to analyze data. Table 1 reports the T-test result for all groups in this research, including novice with less than 5 years working experience and experts. Table 1 contains T-test result of experts and general employees on self-motivation scale. From the table 1, 'Sig. (2-tailed)' for these five items are all less than 0.05. Thus, hypothesis 1 (there is a significant difference between experts and general employees on cognitive self-motivation and self-organisation skills) is supported. In aspects of self-motivation and self-organisation, significant differences exist between experts and novice.

Group Statistics

	Position in hospital	N	Mean	Std. Deviation	Std. Error Mean
SM1	novice	15	3.3333	.61721	.15936
	specialist	12	4.6667	.49237	.14213
SM2	novice	15	3.6000	.98561	.25448
	specialist	12	4.7500	.45227	.13056
SM3	novice	15	2.8000	.94112	.24300
	specialist	12	4.4167	.51493	.14865
SO1	novice	15	3.0000	1.00000	.25820
	specialist	12	4.1667	.71774	.20719
SO2	novice	15	3.0000	1.00000	.25820
	specialist	12	4.4167	.66856	.19300

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
SM1	Equal variances assumed	.966	.335	-6.086	25	.000	-1.33333	.21909	-1.78456	-.88211
	Equal variances not assumed			-6.244	24.999	.000	-1.33333	.21354	-1.77313	-.89354
SM2	Equal variances assumed	8.692	.007	-3.729	25	.001	-1.15000	.30838	-1.78513	-.51487
	Equal variances not assumed			-4.021	20.529	.001	-1.15000	.28602	-1.74564	-.55436
SM3	Equal variances assumed	3.917	.059	-5.333	25	.000	-1.61667	.30315	-2.24102	-.99232
	Equal variances not assumed			-5.675	22.439	.000	-1.61667	.28486	-2.20675	-1.02658
SO1	Equal variances assumed	.221	.642	-3.396	25	.002	-1.16667	.34351	-1.87414	-.45919
	Equal variances not assumed			-3.524	24.766	.002	-1.16667	.33105	-1.84881	-.48452
SO2	Equal variances assumed	1.495	.233	-4.205	25	.000	-1.41667	.33690	-2.11052	-.72281
	Equal variances not assumed			-4.395	24.343	.000	-1.41667	.32236	-2.08148	-.75185

(Table 1)

(SM1 is self-motivation skill's first item. SM2 is self-motivation's second item. SM3 is self-motivation skill's third item. SO1 is self-organisation skill's first item. SO2 is self-organisation's second item.)

For research question 2, table 2 contains the result of T-test between experts and novices on technical skills. In the table 2, the value of Sig. (2 tailed) of four items are less than 0.05, which predicts that there is a significant difference between experts and novices in these aspects. However, Sig. (2 tailed) of the third item "I can deftly use computer to make prescription" is more than 0.05, which means that experts and novices are almost similar in operating relative medical software. The reason may be novices are young people who have more access to use new technologies. Also, it is easier for them to learn how to operate new procedures of computer. Therefore, the hypothesis 2 (There is a significant differences between experts and novices in technical skills) is not fully supported. The results suggest that experts and novices differ significantly in technical tacit knowledge, however, one exception is the measure for testing proficient ability to operate relative machines in the work (here computers), which means that novices can also use computers to make prescriptions as deftly as experts. This finding is in accordance to Beverly's (2003) study which suggests that experts and novices are different pertaining to the technical tacit knowledge in the work.

Independent Samples Test

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper

ITS1	Equal variances assumed	.568	.458	-5.792	25	.000	-1.91667	.33091	-2.598	-1.2353
	Equal variances not assumed			-5.877	24.722	.000	-1.91667	.32614	-2.588	-1.2445
ITS2	Equal variances assumed	.097	.758	-5.535	25	.000	-1.41667	.25593	-1.943	-.8895
	Equal variances not assumed			-5.574	24.472	.000	-1.41667	.24534	-1.922	-.9108
ITS3	Equal variances assumed	4.167	.052	-2.887	25	.008	-.50000	.17321	-.8567	-.1432
	Equal variances not assumed			-2.962	24.999	.007	-.50000	.16882	-.8476	-.1523
INSITS	Equal variances assumed	2.790	.107	-3.729	25	.001	-1.15000	.30838	-1.785	-.5148
	Equal variances not assumed			-3.848	24.947	.001	-1.15000	.29885	-1.765	-.5344

(Table 2)

(ITS1 is individual technical skill's first item. ITS2 is individual technical skill's second item. ITS3 is individual technical skill's third item. INSITS is institutional technical skill)

The table 3 below shows that Sig. (2 tailed) of three items for task-related social skills is less than 0.05. Therefore, there is a significant difference between novice and expert on task-related social skills.

Group Statistics

	Possition in hospital	N	Mean	Std. Deviation	Std. Error Mean
TRSS1	novice	15	3.8667	.51640	.13333

	expert	12	4.6667	.49237	.14213
TRSS2	novice	15	2.7333	.70373	.18170
	expert	12	4.2500	.62158	.17944
TRSS3	novice	15	2.6667	.72375	.18687
	expert	12	4.1667	.83485	.24100

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
TRSS1	Equal variances assumed	.716	.406	-4.082	25	.000	-.80000	.19596	-1.20359	-.39641
	Equal variances not assumed			-4.105	24.171	.000	-.80000	.19488	-1.20207	-.39793
TRSS2	Equal variances assumed	.414	.526	-5.855	25	.000	-1.51667	.25904	-2.05016	-.98317
	Equal variances not assumed			-5.939	24.711	.000	-1.51667	.25537	-2.04292	-.99041
TRSS3	Equal variances assumed	.255	.618	-5.000	25	.000	-1.50000	.30000	-2.11786	-.88214
	Equal variances not assumed			-4.919	21.965	.000	-1.50000	.30496	-2.13251	-.86749

(Table 3)

(TRSS1 is task-related social skill's first item. TRSS2 is task-related social skill's second item. TRSS3 is task related social skill's third item.)

In the table 4, Sig. (2-tailed) value is not less than 0.05. Two items of measurement for general social skills are .634 and .321 respectively, hence, there is no significant differences between experts and novices on this measure. Hypothesis 3 (There is significant differences between experts and novices) is not fully supported, in other word, in terms of social skills, experts and novices differ in task-related social skills, but not in general social skills.

Group Statistics

	Possition in hospital	N	Mean	Std. Deviation	Std. Error Mean
GSS1	novice	15	3.7333	.96115	.24817
	expert	12	3.9167	.99620	.28758
GSS2	novice	15	3.6000	.98561	.25448
	expert	12	4.0000	1.04447	.30151

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
GSS1	Equal variances assumed	.010	.920	-.485	25	.632	-.18333	.37829	-.96243	.59576
	Equal variances not assumed			-.483	23.322	.634	-.18333	.37985	-.96852	.60186
GSS2	Equal variances assumed	.001	.974	-1.021	25	.317	-.40000	.39192	-1.20717	.40717

	Equal variances not assumed			-1.014	23.060	.321	-.40000	.39455	-1.21608	.41608

(Table 4)

(GSS1 is general social skill's first item. GSS2 is general social skill's second item.)

For the research question2: whether tacit knowledge is related to perceived performance of medical staff. As in this study, test for tacit knowledge is divided into three parts, cognitive skills (self-motivation skill and self-organisation skill), technical skills (individual technical skill and institutional technical skill) and social skills (task-related social skill and general social skill), the total score of tacit knowledge for each participant in two groups (experts and novices) is calculated. Spearman's correlation test is used to analyze whether there are relations between tacit knowledge and perceived performance (Lambert and Darcy, 2014). The independent variable is the score of tacit knowledge, and dependent variable is perceived performance. In this study, we use medical staff's positions in the hospital to indicate performance difference. It is assumed that experts perform better than novices.

Correlations

			Age	Gender	Education	Working experience	Possition in hospital	Tacit knowledge score
Spearman's rho	Age	Correlation Coefficient	1.000	.193	-.065	.964**	.923**	.875**
		Sig. (2-tailed)	.	.306	.733	.000	.000	.000
		N	30	30	30	30	30	27
	Gender	Correlation Coefficient	.193	1.000	-.351	.130	.200	.136
		Sig. (2-tailed)	.306	.	.057	.492	.290	.500
		N	30	30	30	30	30	27

	Education	Correlation Coefficient	-.065	-.351	1.000	.050	.026	-.055
		Sig. (2-tailed)	.733	.057	.	.792	.893	.787
		N	30	30	30	30	30	27
	Working experience	Correlation Coefficient	.964**	.130	.050	1.000	.961**	.879**
		Sig. (2-tailed)	.000	.492	.792	.	.000	.000
		N	30	30	30	30	30	27
	Position in hospital	Correlation Coefficient	.923**	.200	.026	.961**	1.000	.864**
		Sig. (2-tailed)	.000	.290	.893	.000	.	.000
		N	30	30	30	30	30	27
	Tacit knowledge score	Correlation Coefficient	.875**	.136	-.055	.879**	.864**	1.000
		Sig. (2-tailed)	.000	.500	.787	.000	.000	.
		N	27	27	27	27	27	27

**. Correlation is significant at the 0.01 level (2-tailed).

(Table 5)

From the table 5, it can be shown that a strong correlation exists between the tacit knowledge score and positions of doctors, with the value of .864. It means that expert has more tacit knowledge than novice in cognitive skills, technical skills and social skills. Higher tacit knowledge score is beneficial to medical workers to finish tasks in the work and reach to expert level. Therefore, hypothesis 4 (Tacit knowledge is correlated to the perceived performance in medical environment) is fully supported. This is in accordance with Sternberg et al. (2000)'s research which shows that tacit knowledge is a strong indicator to success in the work environment.

Moreover, the table 5 also suggests that there is a weak relation (.055) between education level and tacit knowledge score, which is opposite to the research result of MaLeon, Steinert and Meagher et al. (2006), who find that the higher education participants received, the better they perform in the tacit knowledge test. The reason may be that in this research, most participants get the bachelor's degree, and only one expert has the masters' degree, therefore, the relation between education level

and tacit knowledge score cannot be found out.

Gender is also an insignificant factor pertaining to tacit knowledge level, with the correlation value of .136, which reflects that there are a few differences between female and male doctors on working performance.

However, working experience is strongly associated to tacit knowledge level, with the correlation value of .879. Doctors with long years of working experience tend to achieve high scores on tacit knowledge test. This result corresponds to Beverly's (2003)'s study, which contends that tacit knowledge increases with the experience.

Findings

In a nutshell, this study has following findings. In terms of research question 1, the researcher at first compares expert and novice on the tacit knowledge test from three aspects: cognitive tacit knowledge, technical skills and social tacit skill. The result finds that a significant difference exists between medical expert and novice on cognitive tacit knowledge, respectively in self-motivation and self-organisation skills. Experts get higher score on these items than novice. Hypothesis 1 (There is a significant difference between expert and novice on cognitive skills, including self-motivation skill and self-organisation skill.) is fully supported. Similarly, a sharp difference can be found in individual technical skill and institutional technical skill, except for one item regarding to the operation of computer to make prescriptions. Hypothesis 2 (There is a significant difference between expert and novice on technical skills, including individual technical skill and institutional technical skill.) is not fully supported. However, in the third aspect of tacit knowledge, namely, social tacit knowledge, results are different from Hypothesis 3. Expert and novice differ in task-related social skills, but not in general social skill. Expert tends to use social channels to improve professional skill, participating nation-wide meetings while novice shows weak tendency to do it. The reason can also be that novice has not so much social resources and opportunity to join nation-wide meetings as expert. Experts have more opportunity to be invited to take part in such meetings. Nonetheless, novice performs the same as expert in other activities not directly to medical work.

In terms of research question 2, Spearman's correlation test is adopted to investigate if there are relations between tacit knowledge and perceived performance in the hospital. This study uses position as the only indicator for perceived performance, because it is assumed that expert has better performance than novice. Therefore, the independent variable in the test is tacit knowledge score and the dependent variable is the position in the hospital. The result shows that a strong relation (.864) exists between these two variables. Expert gets higher score on tacit knowledge in contrast with novice. Tacit knowledge is positively related to

perceived performance in medical area.

Findings in this study are in accordance with Ryan and O'Connor's (2009) study that tacit knowledge has an effect on team performance, also, Johan and Engel's (2008) conclusion that medical specialist has more skills in specific medical diagnostic reasoning than novice and Wagner's (1987) research that leaders and managers performs better on tacit knowledge test than general employees. The difference of this research to others is that firstly, the study focuses on medical staff in general; secondly, this study is based on the Wagner's (1987) tacit knowledge framework and design questionnaires from three aspects, rather than creating a series of scenarios to test tacit knowledge as other studies.

Discussion

Research on tacit knowledge has been expanded over a number of years. The importance of tacit knowledge is recognized by many scholars in multiple disciplines. This study specifically contrasts medical expert and novice on tacit knowledge and finds that (1) there is an evident difference between the two groups in managing self, managing others and managing tasks, which form the basic framework of tacit knowledge in Wagner's (1987) paper; (2) there is no obvious difference between expert and novice on general social skills; (3) tacit knowledge is positively correlated to perceived performance in medical environment. The reason for choosing medical area as research setting is that firstly, the difference between expert and novice on medical skill is significant and evident. Thus, their position can be used as the measure for perceived performance. Secondly, there is a gap in tacit knowledge research in medical area, since most research concentrates on academic and management environment. This research bridges this gap.

According to the result, in four hypotheses, hypothesis 1, 2 and 4 are supported and hypothesis 3 is not fully supported, because in hypothesis 3, task-related social skill differentiates expert from novice significantly, while general social skills not. It is surprising that in self-motivation and self-organisation aspects, expert and novice are different from each other. Compared to young workers in medical area, experts tend to be more punctuate on working time and arrange time appropriately, for example, managing one's time for multiple tasks. Also, appropriate organize one's working time is also associated to working performance. Multi-tasks are common to most workers in a busy or emergent environment, how to distribute one's time on different tasks and balance one's work and life are important factors to improve performance. This provides practical implications to HR workers to develop more effective training programs. The technical skills, like using relative medical software and being familiar with the big picture in working area, are also associated with performance of doctors. In training procedures, getting familiar with relative medical policy and up-to-date development on medical technology are beneficial to novice to improve tacit knowledge.

Social interaction is an important theme in leading and management research. In terms of social skills in this study, developing professional networks are significant for a medical worker's performance. This research shows that medical staff communicating and interacting frequently and positively with other colleagues is more effective in their work. The reason can be the creation of knowledge among them when they share the knowledge in the communication process. HR managers can organize meeting, seminars, small discussions in fixed time in the hospital to create an environment for medical staff share their job experiences. Novices may find it effective to talk with experts and ask questions to them. Frequent communications with senior doctors can be a quick way to overcome difficulties and to improve performance. Open communication not only provides novice opportunity to learn from expert, but also helps hospital to build sharing cultures, further converting tacit knowledge to explicit and creating new knowledge endlessly. Participating nation-wide seminars or meetings help novice to understand professional knowledge, influencing performance. Nonetheless, a good understanding of explicit knowledge is also necessary, which can be converted into tacit knowledge in a large number of practices. Hence, medical students should also learn theoretical knowledge diligently to accumulate enough explicit knowledge. In this way, it will be easier for them to understand and grasp tacit knowledge with explicit theory as a base. The finding of positive relation between task-related social skill and perceived performance add credence to existing literature about building social networks in the work and at the same time provides new viewpoints to future research on tacit knowledge research in medical sector.

To summarize, this study contributes to tacit knowledge research theoretically and practically. In the theory, the research bridges the gap in the literature that little empirical evidence has been presented on the link between tacit knowledge and improved performance in medical environment. It offers new insights into the knowledge management in medical area, that is, task-related social skills also contribute to satisfying performance. This finding corresponds to Insch, McIntyre and Dawley's (2008) study, which concludes that social interaction is related to academic performance of students. The only difference is that this finding is in

medical area, while their finding is on academic campus.

The research also has practical implications to human resource staff working the hospitals regarding to training and development programs for medical staff to improve working performance. It is suggested that self-management and self-organisation ability is linked to overall performance, and programs on these competencies can be effective. On the basis of this research, scholars in the future can develop situational test of tacit knowledge in managing self, others and tasks, for HR practitioners to select highly competent candidates and make hiring decisions.

However, this study is limited in its scope of 30 samples. Therefore, it is hard to generalize the conclusion. Future research should test the effect of tacit knowledge in large population. In addition, due to lack of knowledge in medical area, this study measures tacit knowledge in general sense. Researchers in the future need to develop more professional framework of medical tacit knowledge and may investigate each component of tacit knowledge specially. Besides, the study just focuses on novice and expert, among whom the differences are salient. Future research can test tacit knowledge on more groups, including those neither novice nor expert with 5 to 14 years of experience.

Conclusion

Many scholars recognize the importance of tacit knowledge in working performance, but there is little existing evidence showing the link of it to doctors. Sternberg et al. (2000) said, "tacit knowledge distinguishes more successful individuals from less practically successful" (Sternberg et al, 2000, p.105). Although this research provides an initial step in research on medical tacit knowledge, limited scope and not specific tacit knowledge measures make it hard to generalize in a large population.

The theory basis in this research is Wagner's (1987) tacit knowledge framework with three components: managing self, managing others and managing tasks. The quantitative approach in the form of questionnaire is suitable for explanatory or descriptive research (Saunders, Lewis and Thornhill, 2009), a questionnaire modified on the Academic Tacit Knowledge Test (Insch, McIntyre and Dawley, 2008) is adopted to test medical staff's general tacit knowledge. The sample is randomly selected from doctors in a Chinese hospital, mainly composed of experts and novices. The researcher contrasts their scores respectively in three aspects, and finds significant differences between the two groups on cognitive skills (self-motivation and self-organisation skills), technical skills (individual tacit knowledge and institutional tacit knowledge) and task-related social skills. Moreover, a strong relation has been found between tacit knowledge overall score and positions in the hospital. In a word, tacit knowledge has a positive impact on perceived performance of doctors. The more tacit knowledge one possesses, the better the working performance. The conclusion is in accordance to Nonaka (1994) and Sternberg et al.'s (2000) research that tacit knowledge is an indicator that differentiates successful workers from less successful workers.

The study contributes to tacit knowledge research theoretically and knowledge management practically, providing insights for HR employees on how to design effective training programs of doctors and how to nurture sharing culture in the medical context. As doctors are 'knowledge workers' who are regarded as individuals with high level of education, practical skills and the ability of applying

such skills in the solving problems (Bettis and Hitt, 1995), the nature of their work is both cognitive and practical. The conclusion that tacit knowledge has a positive impact on perceived performance adds credence to the nature of medical work. Moreover, the medical tasks require teamwork (Bettis and Hitt, 1995), the study finds that the task-related social skills are associated to doctor's performance. In reality, HR managers in healthcare can organize meetings, seminars or activities allowing novice and expert to talk openly and share experience as well as knowledge. Communication with colleagues, experts and senior doctors helps novice to improve their medical skills efficiently, promoting the creation and conversion of knowledge in medical environment. Future research may further examine each aspect of tacit knowledge and their relations to performance in a larger sample.

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Appendix 1

Questionnaire on Tacit Knowledge

This is a project aiming to examine the relation between tacit knowledge and performance of medical staff.

Tacit knowledge is different from explicit knowledge contained in books. It is a kind of knowledge that can only be acquired from practices, including insights, skills, and practical operations and competencies.

If we find that tacit knowledge is positively relative to medical performance, the research will provide a significant suggestion to HR managers responsible for training and development, that is, encouraging the peer learning between experienced medical workers and novice.

You answer is significant to our research and contributes to the training and development field of HRM in medical sector. We ensure the confidentiality of your answers. Thank you very much for your participating!

1. What is your age?

A. 20~24 B. 25~30 C. 31~35 D. 36~40 E. 41~45 F. above 45

2. What is your gender?

A. Female B. Male

3. What is the highest degree you have received?

A. B.A B. MSc C. PhD

4. How long do you work in medical sector?

A. 5 years and less B. 6~10 years C.11~15 years D. 16 years and above

5. What is your position in the hospital?

A. Novice B. Sub-expert C. Expert D. Head of department

6. Which department do you work?

A. Surgical Department B. Cardiology Department

C. Bone and Joint Department D. Dental Department

E. Department of Emergency E. Department of Chinese Medicine

Please rate following answers from strongly disagree to strongly agree

7. I can complete working tasks on time, for example, finishing the record of patient.

A.Never do it B.rarely do it C.Seldom do it D.Frequently do it E.Always do it

8. I love my job even though I feel tired after a day's work.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

9. I regularly go to work on time.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

10. I can distribute my working hours appropriately on multiple tasks, like time to diagnose and time to write patient's record.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

11. Generally I can balance work and life.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

12. I meet regularly with the head of my department for advices.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

13. I set regular time to check the situation of my hospitalized patients, like taking temperature in order to be aware of abnormal situation.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

14. I can deftly use computer to make prescriptions.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

15. I ask questions and speak in the meeting.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

16. I get involved in the group discussion about difficult diagnosis.

A.Never do it B.seldom do it C.Sometimes do it D.Frequently do it E.Always do it

17. I talk with experts or senior doctors.

A.Never do it B.Seldom do it C.Sometimes do it D.Frequently do it E.Always do it

18. I participate the nation-wide seminars of in my working area to listen to the lectures of famous experts.

A.Never do it B.Seldom do it C.Sometimes do it D.Frequently do it E.Always do it

19. I am willing to participate in the nation-wide medical seminars and meetings.

A.Strongly disagree B.Disagree C.Neither agree nor disagree D.Agree E.Strongly agree

20. I distribute my part of sparing time to my colleagues for relaxation together.

A.Never do it B.Seldom do it C.Sometimes do it D.Frequently do it E.Always do it

21. I get along well with my colleagues.

A.Strongly disagree B.Disagree C.Neither disagree nor agree D.Agree E.Strongly agree

Thank you very much for your time and patience to finish the questionnaire!