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Assessing Nurses' Knowledge Sharing Problems Associated with Shift Handover in Hospital Settings

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Abstract

In hospital settings, the quality and effectiveness of shift handover are critical for continuous and high quality patient care. This paper explores nurses' knowledge sharing problems during shift handover in 6 Australian hospitals. A single focus group was conducted to collect empirical evidence of knowledge sharing problems during shift handover, across the hospitals. Findings indicate a broader set of problems that hinder effective knowledge sharing and suggest that handover standards, codification guidelines, the format of templates, and training in conducting handover need to be improved. Additionally, knowledge codification by health professionals other than nurses needs to be encouraged to improve shift handover. Finally, more guidance and training in using various IT hospital systems are necessary to give entry-level and graduate nurses adequate skills to ensure more effective shift handover. This study emphasizes the importance of people, technology, systems, standards and routine activities to capture and share important shift knowledge.

Keywords

knowledge sharing, shift handover, hospital shift work, IT systems

INTRODUCTION

The transfer of information and knowledge between shifts in shift environments have been researched in a number of settings such as manufacturing, flight control, hospitality and emergency services (Behara, Wears et al. 2005; Fenton 2006). These organizations, particularly critical services such as patient care, have work practices in the form of shifts in which work is carried out around the clock, with a vital process of handover between shifts. Handovers can involve individuals or teams and usually occurs after 6 to 8 hours of work. In healthcare organizations (e.g. 24-hour nursing), shift handover plays a crucial role in the continuity of patient care (Ferran, Metcalfe et al. 2008). The quality of a handover directly affects the care for subsequent shifts (Thurgood 1995). Thus, effective and efficient shift handover practices are essential to ensure that critical knowledge is shared between incoming and outgoing shift-worker teams (Thurgood 1995; Sutcliffe, Lewton et al. 2004).

Current studies on shift handover suggest that healthcare environments experience problems with respect to knowledge sharing during handover (Jacobs and Roodt 2007). This may be attributed to the complexity of patient care systems that include equipment, people, information technology and work practices (Wears and Berg 2005). Some researchers find that as shift patterns in hospitals increase, continuity of care decreases (Borowitz, Waggoner-Fountain et al. 2008). Literature suggests that the seamless transfer of information and knowledge across shifts in shift environments is challenging (Currie 2002; Behara, Wears et al. 2005; Meißner 2007). This aspect is confirmed by literature that states that shift knowledge concerning patients is often not fully codified resulting in key knowledge not being shared between shifts (Fitzpatrick, While et al. 1999; Campbell, Murray et al. 2007). Successful shift handover in hospitals is therefore an important process that affects not only patient care but also a hospital's overall performance, because it ensures efficient service delivery, avoids reinvention of the wheel, improves individual worker productivity and assists in decision making (Hutchins 1991).

The motivation behind this research is to explore the knowledge sharing problems that nurses experience with shift handover in Australian hospitals. By understanding these elements and associated problems of handover between shifts, recommendations can be made to improve the existing status quo. Therefore, the main research question for this study is: *What are the issues that affect knowledge sharing practices of nurses during shift handover* with the sub question *what are the problems associated with IT and shift handover?*

The paper is structured as follows. Key literature of handover and knowledge sharing is reviewed in the next Section, followed by a description of the research methodology. Then the study's findings are described followed by a discussion of the findings, recommendations and a conclusion.

THEORETICAL BACKGROUND

A handover (also called a 'hand-off') is defined as *"the transfer of role and responsibility from one person to another in a physical or mental process"* (Solet, Norvell et al. 2005). In the context of healthcare, a 'handover' was defined as early as 1969 as "*…the oral communication of pertinent information about patients"* (Clair and Trussell 1969). The Australian Medical Association has adopted the United Kingdom National Patient Safety Agency's definition of clinical handover as "*The transfer of professional responsibility and accountability for some or all aspects of care for a patient, or group of patients, to another person or professional group on a temporary or permanent basis*" (2006).

An essential element to ensure the continuation of care in the Health domain is patient handover between shifts (Ferran, Metcalfe et al. 2008). A few studies have explored shift handovers in healthcare settings. Some of these studies report of errors and fatalities in healthcare that may be directly attributed to inefficiencies of the handover process (Kohn, Corrigan et al. 2000). It has been reported that poor handover is influenced by the lack of supportive frameworks and formal advice and guidance (Roughton and Severs 1996). According to (McCann, McHardy et al. 2007) 60.9% of doctors in a New Zealand hospital have experienced clinical problems caused by poor handovers. Furthermore, 31% of doctors surveyed in the United States have also experienced clinical problems during their shifts that could have been avoided with more efficient handovers (Borowitz, Waggoner-Fountain et al. 2008).

Also, literature indicates that poor communication might lead to inaccuracies in handovers (Currie 2002). In 2000, the Institute of Medicine (IOM) published a worldwide report about the errors in healthcare. According to this report, every year around 98,000 patients die in hospitals due to errors as a result of communication failures, of which some are associated with handover (Kohn, Corrigan et al. 2000). In 2007, the World Health Organization (WHO) introduced the "High 5s Project" aiming to raise the safety of patients around the world. The "High 5s Project" announced five standard operating protocols that deal with significant patient safety concerns. One of these standards involves the improvement of communication during patient handover. Despite the development of various tools and strategies to advance communication during handover, the uptake of these tools hasn't generally been as high as expected (Anwari 2002; Obstfelder and Moen 2006).

The importance of knowledge sharing

Knowledge is one of the most important organisational assets that need to be valued, particularly in a healthcare environment. As a result of the growing recognition of knowledge in organisations, a number of descriptions and definitions of knowledge have been proposed. Although many of these definitions are rather similar they all share the common view that one specific definition of knowledge is difficult (Geisler and Wickramasinghe 2009). Based on the highly cited work of Davenport et al., knowledge is defined as (1998): "*A fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of knower."*

It is important to distinguish knowledge from data and information. *"Knowledge is neither data nor information, though they are related, their differences are often a matter of degree*" (Davenport, Eccles et al. 1998). Data is described as simple information that does not present any meaning by itself, which is usually in the form of numbers, words, images or text. Information is extracted and formatted from data and consists of meaningful sentences that reveal useful facts. Knowledge represents individual or group experiences that are unique to everybody (Alavi and Leidner 2001). Polanyi classifies knowledge as either tacit or explicit. Tacit knowledge is subjective, known only to its owner and is difficult to formalize and communicate (for example an individual's strategies of winning a game of chess). Explicit knowledge on the other hand is explicit, objective in nature and can be represented or codified which facilitates its ease of sharing (for example the rules or best practices an individual can follow to play a game of chess) (Polanyi 1962).

One of the most important processes of the knowledge management life cycle is knowledge sharing. It is essential for new knowledge creation and prevents organizations from reinventing the wheel by promoting knowledge reuse. It is also important to differentiate between knowledge transfer and knowledge sharing. The former refers to the movement of knowledge from one part of the organization to the other and the latter refers to the activity of trading experiences, skills or insights between individuals or within a community (Hendriks 1999; Alavi and Leidner 2001; Wenger, McDermott et al. 2002).

The importance of knowledge sharing in shift work

Prior studies in health have shift handover problems as a result of not communicating and sharing specific knowledge during shift handovers. According to (Jacobs and Roodt 2007), the organizational culture should be managed in such a way that people are willing to share what they know. An individual's insights and perspectives constitute his or her own internalized knowledge about a situation therefore it's even more important in a shift-related context that these insights are 'carried forward' through knowledge sharing. This can either be face-to-face or through codification of knowledge. Furthermore, it is more challenging to share

knowledge effectively in shift based contexts, because incoming shift workers are not able to continue their tasks without the seamless flow of knowledge between shifts. Therefore knowledge sharing can be critical and expertise need to be transferred accurately (Nissen 2002).

The use of Information Technology in hospitals

It has been suggested that electronic handovers can improve the overall quality of handovers in hospitals (Volpp and Grande 2003). For example, handheld devices can be used as they enable healthcare workers to perform their work more effectively by simultaneously moving around in the ward(s), monitoring sick patients and carrying out clinical handover (Parke and Kanki 2008). However, there are limited studies in literature that report on the uptake and usefulness of handheld devices in these setting. Information Technology (IT) can play both an active and passive role to ensure high-level patient care and safety. The active role is evident from tasks like data mining (Murff, Patel et al. 2003) and error detection using alerts and reminders (Horsky, Zhang et al. 2005). The passive role of IT is reflected by how it assists communication, eases workflow and distributes knowledge effectively and efficiently. IT also plays a crucial role in supporting decision-making processes (Safran, Jones et al. 1998; Patel and Kaufman 2006). Furthermore, the British Medical Association in its regulation on clinical handover namely "Safe Handover – Safe Patients" recommends using IT to support clinical handover (2004). In addition, IT systems can play a significant role in knowledge management. Nowadays, IT systems are able to collect, retrieve and harness the benefits of shared organizational knowledge regardless of the geographic boundaries of an organization. IT systems are therefore able to store codified knowledge and make it available to anyone in the organisation that needs it, without the need to be in contact with authors who created the knowledge (Andersen, 2001).

Considering the problems with shift handover, literature suggests that there is limited literature that focuses on the sharing of knowledge in shift environments. Also, there has been no studies conducted yet that explores the routines associated with shiftwork and ways in which IT can support knowledge sharing in this context. Therefore this study aims to explore this gap by identifying the unique knowledge sharing problems nurses experience with shift handover in hospital settings.

RESEARCH METHODOLOGY

This study aims to identify problems associated with knowledge sharing during shift handover in Australian hospitals. Due to the study's exploratory nature, a qualitative research approach was chosen with an individual as the primary unit of analysis. The idea was to collect individual experiences, attitudes and perceptions on shift handover. Additionally we wanted individuals to discuss and share their problems, ideas and views on shift work as a group. Therefore a focus group meeting was chosen to collect data. Focus groups produce credible, valid information and allows for the sharing and discussion of diverse opinions in a friendly environment (Marczak and Sewell, 2002). They are also becoming increasingly popular in Health Care research (Côté Arsenault and Morrison Beedy 2005; Polit, Hungler et al. 2010). Due to ethical limitations and time constraints at the time of conducting the study, observation of handovers in the various hospitals was impossible; therefore a single focus group meeting was held. Local hospitals and a nursing agency were approached to recruit participants. Due to long working hours and timing of shifts, it was difficult to recruit participants through the agency. Personal contacts identified 6 nurses from different private and public hospitals across Melbourne who were approached to participate. Krueger and Casey (2000) state that between 6 and 10 participants are ideal for focus groups. (Table 1 summarizes participants' details and issues explored). The meeting proved useful to gather rich contextual descriptions of nurses' shift handover experiences across different hospitals and work departments. Furthermore, the group interview format allowed the gathering of social and cultural phenomena that impacted on knowledge sharing during handover (Graneheim and Lundman 2004)

Table 1: Participant details: gender, hospital type, years experience, department and issues explored

Nurse (Gender)	Hospital type	No years experience	Dept. of work	Issues explored
A – (Male)	Public	20 years	Critical care	Problems with handover Handover sheet & documentation IT problems & systems used Handover routines Tacit & explicit knowledge sharing Codification
B – (Female)	Private	15 years	Emergency	
C – (Female)	Private	27 years	Critical care	
D – (Female)	Public	20 years	Vascular	
E – (Female)	Private & public	15 years	General surgery	
F – (Female)	Public	13 years	Emergency	

Data Collection and Analysis

The meeting was held at the University of Melbourne, lasted approximately an hour and forty-five minutes and questions prompted participants to share their opinions and experiences of handover related to specific issues as indicated in Table 1. The meeting was video-recorded which proved useful for data analysis since it captured participants' non-verbal responses (gestures and facial expressions), which confirmed or refuted points discussed. The full audio was transcribed verbatim for analysis.

Data analysis comprised a few passes through the data to identify key themes and subthemes based on the three steps of open, axial and selective coding to classify the data into meaningful themes and subthemes that answer the research questions (Neuman 2002). Identification of codes through the various cycles helped to crystallize thinking to identify a set of final themes that represent general stable findings across the cases. Findings were triangulated with a report on shift handover in Victorian hospitals (McLean, 2008) and confirm that further in-depth research in clinical handover is required.

CASE STUDY FINDINGS

A normal day in a hospital is divided into 3 shifts of 8 hours each labelled as morning, evening and night shift. Participants indicated that they each carried a responsibility of between 1 and 5 patients per shift. After each shift, for each patient, handover knowledge needs to be shared with new incoming shift workers. Quality information and knowledge is required by the new set of shift workers to provide successful patient care. Therefore shift handover quality is of high importance. The sections that follow present the findings based on the major themes that emerged from the final data analysis.

Handover routines across hospitals and the handover sheet

The focus group indicated that shift handovers across the various hospitals were essentially similar across hospitals. All nurses received 2 handovers, a general and detailed handover. The general handover (30 minutes) for incoming staff is in the form of a team meeting held prior to the shift in a meeting room and is conducted by the nurse in charge. The handover sheet is used to briefly report on all patients in the ward. This sheet is printed prior to each shift (one sheet for all patients in the ward)., which contains essential patient information (e.g. personal details) together with basic updated diagnostic information of the patient's condition, briefly codified from previous shifts. Each nurse gets a printed copy of this sheet with space to manually add personal notes (codify individual experiences) for each patient while on shift. Following the general meeting, a detailed verbal handover usually occurs whereby each nurse receives more information of their allocated patients from the nurse they are replacing. Once again, the handover sheet is used. The detailed handover is crucial to share more knowledge one-on-one as one participant claimed: *"We get a handover of all the patients that are in the department from the nurse in charge- if I was in charge of cubicle 1 to 4, I would then go to those cubicles and get another handover from the nurse who was looking after cubicle 1 to 4. A more detailed one [handover]"* (Nurse B).

Routines for the detailed handover across the various hospitals differed as this took place either at the bedside of the patient, outside the patient's room or in a separate room away from the patient. It was crucial to try and capture as many knowledge flows as possible from all the different health practitioners - hence the reason for conducting a general and detailed handover. However, nurses could only codify limited knowledge during shifts using the printed handover sheet. Additionally not all the codified knowledge could be entered in the computer systems due to time constraints. The handover sheet was clearly the most important element for knowledge sharing about each patient during handover as one participant commented: *"The handover sheet will tell us the patient's room number, name, age, sex, patient's doctor and patient diagnoses, the diet the patient's on. The nurse looking after the patient will give you [codify/document] what the patient did during the day or night. Everything that has been happening with that patient"* (Nurse A).

Problems that affected knowledge sharing during shift handovers.

(i) Limited handover time: all participants indicated that there was limited time to receive and exchange tacit knowledge during handover. Some participants found the time not enough to share all their knowledge of previous shifts, as two of them indicated: "*…it is the logistics of handing over 40 patients in thirty minutes*". (Nurse A) *"Now and then they [nurses] just miss to say something. Sometimes we are in a rush. We've got 5 patients [to hand over] ".* (Nurse D).

(ii) Limited time to codify: most participants indicated that handover were difficult due to limited time to codify their knowledge during shifts. Not all nurses were happy with codified knowledge received from prior shifts, as manual shift documents were often not updated or as detailed as required. Additionally, there was no single standard to conduct shift handover: i.e. a mixture of verbal and documented handovers occurred which was at times confusing. Some nurses indicated that they sometimes could only pass on knowledge verbally if there was no time to codify their thoughts/experiences. Comments were: *"If it's a really busy shift that is when things get missed. Occasionally it falls down that path where things are not updated [codified knowledge] you think I am going to update that and there are some things that you miss and you just have to hand it over verbally. Often I'll write the notes then I realize I also have to do the pathway, then the handover sheet."* (Nurse C). "*…sometimes we don't do it [codify], because there is no time."* (Nurse A). *"…we haven't really got time to go to the computer and do all those things [codify knowledge]"* (Nurse D).

(iii) Overloaded: one participant indicated that they felt overloaded with too many codification tasks to do: "*You have to go to the folder of the patient and write all these forms and then go back to the computer and then do your update plus the handover sheet again… the other thing I don't like is over paper work. For me as a nurse I want less paper work, because the paper work is ridiculous. "* (Nurse E).

(iv) Duplication and repetition: most participants felt that the duplication of documents and repetitive work impacted on their ability to do quality shift handovers. Additionally a large collection of information recorded during shifts, were duplicated across documents. Participants indicated that it was difficult to make sense of all this information, which also led to a waste of time. "*What I find repetitive is you've got the handover sheet which is kept up to date, then you've got paper work and sometimes it can be the same thing. The paper work, computer, progress notes, pathways. I feel like I am doing the same thing in all different little areas… we don't know ourselves why we have it on the computer why we have it in the history why we have it in the handover sheet, sometimes I feel like I am repeating the same thing."* (Nurse B). *"Sometimes we will write the same thing twice, we will sign the drug in the drug chart and in the running sheet as well*." (Nurse F).

Also, some of the IT systems used, required a repetition of codification tasks. A nurse would codify the same knowledge, which was stored in multiple forms and templates across different IT systems, as two participants indicated: *"We've got a new system. It is a current up to date system but once we started using it we were under the impression that it would cut the duplication but no it is not the case; we double document again."* (Nurse F). "*If an incident happen we use to write it down on pieces of paper, but we use the computer now. Like if someone had a fall. It [IT systems] is time consuming, because it tends to repeat itself a lot, because you write the incident than you sort of write it again in another bit. Very repetitive."* (Nurse C).

Problems with IT systems and handover

There were mixed views about existing IT support systems in place to share knowledge during handover. On the one side participants were positive about the availability of real-time information about each patient, while there were a number of specific problems with respect to knowledge sharing during handover namely:

(i) *Downtime of IT systems:* One major problem was the lack of back-up systems in place in the event of failure of any of the existing IT systems. Thus, when one system crashed it was impossible to retrieve any information /codified knowledge until the system was up and running again: "*I think with the IT systems sometimes it crashes so it is a real nightmare. Sometimes not the whole system but certain systems like where you do discharge you need to print a discharge sheet….it might crash for a couple of hours or a couple of days."* (Nurse B).

Participants indicated that they could not use any IT systems in the event of system crashes to support handover, but had to revert to manual systems at these times:*"Occasionally they do go down, where the system fails and crashes and we then have to completely convert back to paper and then when the system comes back online we have to enter all those paper details into the system."* (Nurse F)

Another participant indicated that IT system downtime affected their medication dosages to patients which in turn affected handover since important knowledge could be missed for not being codified: *"… also there are occasions where we have to give out a lot more medication than just our own patients too. So it is very crucial [system failures]."* (Nurse A)

(ii) Information silos: Participants indicated that there were multiple IT systems used in isolation in their respective hospitals which they often had to access to get key patient information. Some workers did not have access rights to access some of the systems which impacted on their handover tasks, as one participant commented: *"…because the wards upstairs do not have access to them [the IT systems] They would have only what we printed."* (Nurse B)

(iii) Fragments of information: another participant indicated that different systems stored multiple pieces of information in different formats that had to be pieced together for sense-making from a knowledge sharing viewpoint: *"…even though you get a little bit of history on the computer systems. The actual big picture you have to collect."*(Nurse E)

General problems with the sharing of shift knowledge

It was found that nurses' behaviour and attitudes also impacted on the quality of shift handovers.

(i) Codification problems: interviews indicated that individual participants usually codified experiences such as specific treatment given to patients, their progress, medication administration and noteworthy experiences that had to passed on to subsequent shifts. However, codification was limited to nurses only, while key knowledge from other medical staff such as doctors or physiotherapists were not recorded but only passed on verbally as explained by some participants: *"… we are the only ones who document (handover sheet)."* (Nurse B) *"With all the different doctors and allied health, so many different groups are involved. And we are probably the only ones who actually give input for the handover sheet."*(Nurse C) *".. at the end of the day everything comes down to the nurse [updating the handover sheet] and that is why we are paranoid about it."* (Nurse D)

In some hospitals all nurses had to codify knowledge using the handover sheet, e.g. each nurse was responsible for codifying key knowledge about each patient and then informing the nurse in charge of the updates. In other hospitals, the burden rested on the nurse in charge's shoulders. Only she/he was responsible for codifying knowledge and updating the handover sheet. This person had to exchange knowledge with each nurse in the team, and would then create or update the handover sheet. Participants expressed their concerns about this: *"…not all nurses have access to the computer to update those handover things it is usually the nurse in charge."* (Nurse C) "*We are a bit different we update ourselves. If you are looking after the patient you just go and quickly add it in the computer but you would also let the person in charge know. It keeps thing more up to date I think that way…if just the person in charge updates it is a huge responsibility for one person to do because there might be forty patients and that's a lot of time and they've got other things to do as well "* (Nurse B) *If I leave it for the nurse in charge to codify what I have done that would not be fair, because they might forget to write it and I will be in trouble because it wasn't written"*(Nurse F*).*

It was sometimes difficult to have work continuity, because on occasions where participants have been away, it was difficult to collect prior knowledge as some nurses would not give out or share their knowledge with the person in charge as one participant indicated: "*…well if I have been on my days off and came back and I am in charge that day [nurse in charge]. It is very hard, especially in the morning shift to catch up on forty patients. Some of the nurses won't realize I've been away, so they won't handover some things."* (Nurse A)

(ii) *Accuracy of codified knowledge:* although participants indicated that they spent a large amount of their time updating manual paperwork and electronic documents, it was clear that handover sheets with codified knowledge were not always accurate. This also lead to inaccurate handover meetings, since the nurse in charge relied on the codified knowledge to guide handover meetings. A number of participants agreed that some handover documents were subjective or emotional and not always factual, objective and to the point. Thus, participants claimed that they were forced not to fully rely on what has been said in handover meetings or what has been codified in their handover sheets. Instead every participant relied on their own individual judgment based on his/her nursing experience: *"It is subjective [handover sheet]. Sometimes it is the nurse personal opinion, like for example, the nurse handed over that this patient is extremely difficult to look after and this and that and you go in and you think the patient is lovely, there are no problems at all."* (Nurse B) "*… So they said one thing then you go to look after the patient then it is completely different. Where did that handover come from? If you are looking after someone, we have to use our own assessment skills versus what has been said in the handover meeting. Use your own judgment."* (Nurse A) "*..Yeah. I would listen to handover but not %100 guarantee on it …I suppose there is doing your own assessment on your patient and making sure that you know the diagnoses and look at your own nursing experience… And looking at the charts as well and updating your knowledge in that way "(*Nurse C)

(iii) *Updated and outdated handover sheets:* participants were aware of the importance of updating handover sheets and indicated that they often found that this aspect was overlooked, but that it was important and time had to be made to do so: *"Where I was taught, we update changes as they happen throughout the day, but it doesn't always happen"*. (Nurse A) "*..The other thing about your handover sheet - it has to be in such a way that it is updated every shift, because if a family member or a doctor or somebody else calls and they want information and the nurse is not available. You as the other nurse picking up the phone; you need to be able to give the person a little bit of information. You can't say I don't know*" (Nurse E) *"…you have to find time in your shift to do an update*" (Nurse D)

However, the most frequent problem was that handover sheets were not updated as frequently as required. Sometimes sheets contained irrelevant knowledge that was not useful or even worse; there were times when important knowledge was not codified:*"Sometimes you have the patient 4 or 5 days and the handover is going on - it is almost like just things are added to the handover"*(Nurse C) *"…some knowledge is not actually relevant any more, but it just keeps on. It is not up to date"* (Nurse B) "*…some of the information on the handover sheet when it changes, it is not removed. Like the patient needs blood tests and they already had that done …sometimes we have a handover that the patient fell and it might have been a few days ago… if I am receiving a handover say from the night staff I feel a lot of times I am not getting enough information* "(Nurse A)

There were critical situations when participants had to double check the handover knowledge with that of prior shifts. *"…sometimes you have to ring up as well, say for example I come on a morning shift, someone has done a night duty and gone home. I come across the medication and it hasn't been signed and I think have they given them but haven't signed it. Sometimes it is the matter of chasing up the previous shift"*(Nurse B)

(iv) Training and education: even though all participants were taught verbal handover skills and how to document from senior nurses, not all nurses received professional IT training on how to use IT systems for handovers. Some participants only had a basic IT training course while others were trained by either nurses in charge or other colleagues:" … *we got trained in service by the IT people who came out …when I started in the hospital, I was taken down to IT and they went through everything with me y. We were taught by a group and*

given printouts on how to do it and that is a one day workshop." (Nurse D). *"Every new staff member, as part of their orientation day, becomes familiar with the IT system. They are trained by the nurse in charge."* (Nurse F) *"…normally when you start, you team up with another nurse or the nurse in charge - they will show you how to use it [IT systems] as you go, no special IT training"* (Nurse B)

DISCUSSION

Findings indicate that shift handover is a complex process with multiple practices and functions that draw on a variety of manual and automated artefacts. Even thought our study focused on knowledge sharing problems during handover, key areas of concern emerged that impacted on the quality of shift handover namely 1) lack of standards, guidelines and templates for quality shift handover, 2) inadequate knowledge sharing and codification time, 3) lack of handover input from other health staff, 4) inadequate training and 4) limitations of existing IT systems for handover. Findings reveal specifically that there is a need for developing integrated Information Systems that facilitate handover with the potential of developing Knowledge Management Systems that support knowledge codification and sharing practices for more efficient shift handover. Key problems and recommendations to overcome these problems are briefly discussed in the next paragraphs.

Problem 1: Lack of standards, guidelines and templates

Firstly, across all the hospitals, it was clear that there was no single, consistent standard or process for conducting handover. Each hospital's handover process, standards, guidelines and templates were different, yielding different results. There was no clarity on the 'best' way to conduct quality handovers or the most essential elements required for effective handover.

Secondly, there was no agreement on what had to be codified or documented on each handover sheet. This resulted in gaps in the explicit knowledge for each patient. Some participants did not consider shift handover documents as a means of sharing knowledge, but rather legal documents. As a result, their focus was on codifying key *liability information* and what happened to patients instead of codifying personal experiences and insights to do with patient conditions (Walsh and Ford 1990).

Also, some nurses had a laissez-fare attitude towards codification, which often resulted in key knowledge not being codified or made explicit. Specific codified knowledge for subsequent shifts were therefore not care-specific. The literature suggests that a handover needs to be a critical communicative process that focuses on patient care (Davies and Priestley 2006) and they are more efficient when they reveal problems, hypotheses, individual observations about a patient's condition and advice or some guidance on how problems to do with a patient's condition can be solved (Vandenbosch, Bentley et al. 1986; Kihlgren, Lindsten et al. 1992). Therefore, formal structures and templates need to be designed to capture appropriate patient care information and knowledge. Literature also states that it is estimated that handovers can cause communication errors when they list what has been done to the patients instead of listing a predictive diagnosis of a patient's condition (Grusenmeyer 1995).

Problem 2: Inadequate knowledge sharing and codification time

Solet et al. (2005) indicate that the amount of time spent to arrange and perform handovers in clinical settings directly affects its content. All participants indicated that there was limited time to codify their key insights and experiences using the systems and ways in which handovers were conducted. This may be attributed to the design of the handover sheet, the lack of guidelines on what to codify and lack of supportive systems to support knowledge codification. A large degree of duplication and repetition of tasks were present which greatly impacted on time to codify. Participants also indicated that in the event of poor handovers, a large amount of time was wasted on search activities to source information and knowledge and combine bits and pieces of such knowledge. This also impacted on their time to care for patients.

Additionally there was a larger focus on explicit knowledge than on tacit knowledge, i.e. to codify knowledge using the manual or computerized handover sheet. Handover meetings as a group were ideal to share tacit knowledge, but were mostly used as a forum to brief participants on problems of earlier shifts. Participants could not exchange tacit knowledge and had to arrange separate face-to-face sessions to do so which was difficult to arrange due to a lack of time. More opportunities for tacit knowledge sharing may allowed nurses to identify and eliminate inaccuracies in their knowledge and procedures which may ease and support their performance (Herbig 2001)

Problem 3: Lack of handover input from other health staff

Findings indicate that knowledge codification was limited to nurses only. Key perspectives, insights and reflections from medical and allied professionals were not codified. Therefore the 'full picture' of a patient's condition was not available in the form of codified knowledge. There is a need to engage perspectives from other health practitioners as well (e.g. specialists) as they also play an active role in improving clinical handover. It is

expected that handover quality would increase if perspectives (even in a brief format) from other health professionals were also included (O'Connell and Penney 2001).

Problem 4: Inadequate training

Although handovers have been acknowledged as an important part of a nurse's learning experience (Wolf 1989), participants indicated that they received little or no training as part of their formal education on how to conduct handover. Instead they relied on senior staff in learning how to conduct handovers. Also, some of the participants haven't received formal IT training on how to use existing hospital systems for more efficient handover.

Problem 5: Limitations of existing IT systems for handover

IT systems may have considerable potential to improve the quality of handovers. However, findings suggest that current systems used by the various hospitals did not fully enable or support either knowledge codification or the retrieval of key information for handover. Instead, across all of the cases, it was clear that it was difficult to cope with the various silos of systems and duplicated information, which impacted on handover and individuals' time. Information had to be extracted from various manual and automated systems making it difficult to integrated and form a full picture of a patient's condition. It was apparent that there were no Information Systems that were integrated with handover tasks and activities. Additionally information was duplicated across different types of non-integrated systems.

The next section gives key recommendation on ways in which handovers can be improved in order to improve knowledge sharing between shifts.

Recommendations

Based on the prior discussion, it is suggested that handover processes are analysed and restructured by specifying standards, guidelines and designing appropriate templates for shift handover. This may improve shift handover codification and knowledge sharing processes and ultimately time management of individuals. It is also suggested that handover standardization may better engage staff in the handover process. By providing more structured and informative handover guidance. Also, improved IT systems may be designed to support the handover process and knowledge codification. Handover practices and standards need to be revisited and reviewed regularly to assess their value and ensure that the most critical knowledge is codified for effective and efficient shift handover. This challenge is confirmed by various authors who claim that existing handover mechanisms lack advice and guidance on the structure of handovers (Roughton and Severs 1996; McKenna and Walsh 1997). There is a need to integrate shift handover practices and functions in a way that allows for the integration of key information and codified knowledge. This would promote knowledge sharing within teams and encourage all healthcare practitioners to provide inputs. Additionally, tacit knowledge sharing specific to handover should be encouraged by implementing working procedures that allow nurses to reflect on their own experiences. More dedicated time may need to be introduced for debriefing during handover meetings. Table 2 summarizes the recommendations and thereby highlights the main suggestions that are driven from this study.

Table 2: Summary of recommendations to improve shift handover

Key Recommendations
1. Analyze handover processes and activities to identify standards and templates that facilitate handover
2. Customize existing and design of new integrated IT Systems that form an integral part of handover routines and practices
3. Develop Handover Guidelines to guide and improve the codification of shift knowledge
4. Encourage codification of nurses' personal experiences and insights rather than patient's historical events
5. Engage other key health practitioners to codify and contribute their experiences to shift handover
6. Improve tacit knowledge sharing opportunities specific to handover
7. Emphasize formal training in conducting handover and training nurses to better use IT systems for handovers

Study limitations

This study has some limitations that need to be acknowledged. Only 1 focus group meeting was conducted and the results should be understood within the limitations of the methodology adopted. It was not possible to observe how shifts and handovers were conducted in hospitals. Such observations required a higher level of ethics application and would have deepened the researchers understanding of routines and non-routines associated with shift work and helped to confirm deeper problems that were reported. Due to confidentiality and privacy issues, an analysis of IT systems and specific artefacts used during handover were prohibited. Finally, the study took place in Australian hospitals and participants were a mix of private and public health workers, so there are limitations in how far the findings can be generalized to other settings and institutions.

CONCLUSION

This paper explores the mechanisms used in Australian hospitals to share knowledge within and between shifts. Based on evidence found, the nature of shifts relies on knowledge flows. Handovers need accurate codified knowledge, which promotes effective knowledge sharing. It is clear from the results of this study that standards and supportive infrastructures are required to guide effective knowledge sharing during handover processes. It is hoped that the data provided in this study could assist in developing of such a framework, although a larger study would provide greater certainty in terms on what should be included in such a framework. Further research is now needed to see if our findings hold in different types of settings and in other countries.

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