Developing a minimum dataset for nursing team leader handover in the intensive care unit: a prospective interventional study

By

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Abstract

Since the World Health Organization listed clinical handover as a top five priority area for patient safety, the evidence-base and resources generated to improve handover communication has increased. But literature specific to the intensive care unit (ICU) handover, particularly handover from shift-to-shift by the ICU nurse Team Leader (TL) remains limited.

The aims of this three-phase interventional study focused on understanding current TL handover practices and implementing a handover strategy to improve this practice. The aim of Phase 1 was to determine the content of ICU nursing TL handover. The aim of Phase 2, was to identify the key components for inclusion in a handover minimum dataset (MDS) and, the aim of Phase 3 was to implement and evaluate an electronic minimum dataset (eMDS) for nursing TL handover. A modified version of the Knowledge-to-Action framework guided each phase of this research. The study was conducted in a 21-bed ICU, at a tertiary referral hospital in Brisbane, Australia. Senior nurses working in TL roles were sampled for this study.

Phase 1 involved audiotaping TL handovers to identify the content discussed during handovers. Audio recordings were transcribed and content analysis was used to analyse the data. A quantitative approach was used to identify the frequency of a priori categories and subcategories. Phase 2 consisted of focus groups with TLs to determine the content to include in an MDS for handover. Descriptive statistics were used to analyse responses from focus groups. In Phase 3, TLs were given surveys to complete to determine the barriers and facilitators to eMDS use prior to implementation. Survey results were analysed using descriptive statistics and the frequency of recurring responses to
dichotomous and open-ended questions were summarised. Three months post eMDS implementation, TLs’ use of the eMDS was assessed by auditing and evaluating nurses’ perceptions through the distribution of surveys to TLs. Descriptive statistics were used to summarise audit and survey data.

Phase 1 findings revealed that TL handovers contained variable content, and that aspects of handover did not meet the Australian National Standards (e.g. handovers were conducted at the desk rather than bedside).

In Phase 2, TLs identified the content to include in an MDS for handover. The content of the MDS was structured using the ISBAR (Identify-Situation-Background-Assessment-Recommendations) schema and included additional items specific to ICU nursing TL handover.

In Phase 3, the barriers and facilitators to eMDS use were identified prior to implementation. These focused on usability, content and efficiency of the eMDS, and informed implementation strategies adopted to implement the eMDS. Implementation strategies included education, champions, reminders and ad hoc audit and feedback. Three months post implementation, audit results revealed TLs had relocated handovers to the bedside, and TLs were using the eMDS. Some key content items were discussed frequently while others showed no improvement or were absent from handovers. Results also highlighted that additional documentation was required alongside the eMDS to conduct handovers. Surveys of TLs’ perceptions identified benefits and disadvantages to eMDS use. Benefits were: improved patient content and time saved updating the tool. Disadvantages were: irrelevant patient content included, with pertinent content missing from handovers, and difficulties navigating the tool. Shortcomings of the eMDS were a result of limitations within the clinical
information system (CIS) to filter and draw relevant data required into the tool. Nurses suggested eMDS modifications were needed to increase usability.

This is the first study to examine nursing TL handover, and to implement and evaluate an evidence-based eMDS for nursing TL shift-to-shift handover in the ICU. While the eMDS requires further testing and modifications, it is the first evidence-based handover tool developed for the MetaVision CIS that can be utilised and adapted by other ICUs. Continual iterations of the eMDS should occur in collaboration with vendors, information technology teams, and in alignment with national guidelines, to increase patient safety. The use of simulation in education and training, is the next step to informing relevant changes to the eMDS and optimising ICU nursing TL handover practices. Organisations need to recognise the value of practice improvements by investing funds to successfully implement and sustain the use of evidence-based practices. Evidence-based practices that are embedded in healthcare settings will ensure patients receive quality care and will improve patient outcomes.
Statement of originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

________________________________________

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<tr>
<td>ACSQHC</td>
<td>Australian Commission on Safety and Quality in Health Care</td>
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<tr>
<td>CIS</td>
<td>Clinical information system</td>
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<tr>
<td>eMDS</td>
<td>Electronic minimum dataset</td>
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<tr>
<td>GU</td>
<td>Griffith University</td>
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<td>HREC</td>
<td>Human Research Ethics Committee</td>
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<tr>
<td>ICU</td>
<td>Intensive care unit</td>
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<tr>
<td>IQR</td>
<td>Interquartile range</td>
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<tr>
<td>IT</td>
<td>Information technology</td>
</tr>
<tr>
<td>KTA</td>
<td>Knowledge-to-Action</td>
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<tr>
<td>MDS</td>
<td>Minimum dataset</td>
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<tr>
<td>NSQHSS</td>
<td>National Safety and Quality Health Service Standard</td>
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<tr>
<td>RN</td>
<td>Registered Nurse</td>
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<tr>
<td>SD</td>
<td>Standard deviation</td>
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<tr>
<td>TPCH</td>
<td>The Prince Charles Hospital</td>
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<tr>
<td>TL</td>
<td>Team Leader</td>
</tr>
<tr>
<td>US</td>
<td>United States</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Dissemination of results

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Acknowledgement of content included in this thesis

Included in Chapter 4 of this thesis are five papers, which are co-authored with other researchers. My contribution to each co-authored paper is outlined in Chapter 4. The status and bibliographic details for each publication, including all authors are listed below.

Chapter 4: Results

Published


Published


Published


xviii
Published


Published

Chapter 1: Introduction

1.1 Introduction

Clinical handover among clinicians, during shift changes is essential to maintaining patient continuity, as well as timely and quality patient care. Clinical handover is defined as “the transfer and acceptance of patient care responsibility achieved through effective communication. It is a real-time process of passing patient-specific information from one caregiver to another to ensure the continuity and safety of the patient’s care” (The Joint Commission, 2017, p. 2). While clinical handover is a critical aspect of patient care, miscommunication and missing information during handover has been linked to patient harm and has been identified as an international safety priority over the last decade.

There are several factors that have led to ineffective clinical handovers including a lack of structured and standardised information exchanged at handover. Despite the generation of handover resources and structured handover tools to improve ward handover communication, handover resources specific to critical care areas such as the intensive care unit (ICU) are limited. For example, there are no evidence-based handover tools to guide nursing Team Leaders (TL) handovers. Nursing TLs are responsible for the coordination of care provided by bedside ICU nurses to a group of ICU patients. The ICU is a high-pressure environment containing patients with acute and complex needs that can change rapidly. Standardised, structured handover tools that are evidence-based are urgently required to reduce adverse patient events associated with miscommunication during clinical handover in the ICU.
This chapter provides an overview of clinical handover in relation to patient safety. Gaps in the literature relating to nursing TL handover in the ICU and strategies for improvement will be discussed. The aims and significance of this research, and the structure of the thesis are also outlined.

1.2 Overview

Clinical handover is an inherent part of patient care. Handover predominantly occurs at shift changes, when clinicians take breaks, when patients are transferred between wards or hospitals, and for referrals or discharges from facilities. In recent years, clinical handover has been identified as a major contributing factor to adverse patient events, with an estimated 80% of serious medical errors attributed to communication errors between care givers at handover (Joint Commission Center for Transforming Healthcare, 2012).

Miscommunication is a common problem that occurs during handover, which may be due to ineffective communication methods (The Joint Commission, 2017), misleading or insufficient information (The Joint Commission, 2017), a lack of safety culture (The Joint Commission, 2017), frequent interruptions (Starmer, Sectish, Simon, Keohane, McSweeney, Chung et al., 2013), inadequate time allocated to handover (The Joint Commission, 2017), lack of standardised information (Jewell & Committee On Hospital Care, 2016; Mariano, Brooks, & DiGiacomo, 2016), and limited staffing (The Joint Commission, 2017). Communication failures during handover can lead to service discontinuities, suboptimal patient flow through the system, readmissions, duplication of
services, patient dissatisfaction and patient harm (McMurray, Chaboyer, Wallis, Johnson, & Gehrke, 2011).

Over 10 years ago, clinical handover was recognised internationally as a high-risk area for patient safety. The World Health Organization (WHO) listed clinical handover as a top priority in an effort to improve clinical handover processes and global patient safety (Haynes, Weiser, Berry, Lipsitz, Breizat, Dellinger et al., 2009). This has led to Australia and many other countries actively implementing numerous handover strategies. The Australian Commission on Safety and Quality in Health Care (ACSQHC) has taken an active role in raising awareness and developing resources to improve current handover processes. This work has also led to the introduction of the National Safety and Quality Health Service Standard (NSQHSS) – Clinical Handover, whereby all health care facilities are required to provide evidence of initiatives to improve clinical handover processes to meet accreditation standards (ACSQHC, 2011). These standards offer recommendations, regarding governance and leadership for clinical handover, documentation and structured clinical handover processes and the inclusion of patients and carers in clinical handover (ACSQHC, 2012). While the ACSQHC released version 2 of these standards which included updated information on handover in the past six months, throughout this research version 1 was the standard, therefore it used throughout this thesis. Similarly, the Joint Commission in the United States (US) recommends a demonstrated leadership commitment to successful handovers and safety culture, standardised content, face-to-face handovers, handover training, monitoring interventions and driving improvement, sustaining best practice, and making handover a cultural priority (The Joint Commission, 2017). The implementation of these standards has led to
significant work in this important area resulting in the development of handover tools (mnemonics, checklists, minimum datasets) and resources (education strategies, policies and procedures) to improve handover practices in healthcare. Despite significant advancements in handover there is a lack of evidence to inform handover in the ICU. Currently, there are limited resources for senior nurses to utilise when discussing multiple ICU patients.

1.3 Why Team Leader handover?

The ICU is a unique and dynamic environment requiring collaboration between multidisciplinary team members to provide timely and effective care to patients (Hoskote, Racedo Africano, Braun, O'Horo, Sevilla Berrios, Loftsgard et al., 2017). Patients are critically ill and treatment can rapidly change depending on the complexity and ever-changing state of the patient. The ICU is an event driven, time pressured environment prone to frequent distractions (Hoskote et al., 2017). Although several handover tools and resources have been developed for ward areas there are limited resources available or specific to ICU to handover critical patient information (Bakon, Wirihana, Christensen, & Craft, 2017). A lack of resources to support TL handover has led to handovers that lack structure and standardisation and, contain variable content and processes. These factors increase the likelihood for miscommunication to occur during handover compromising patient care and safety. Nursing handovers occur frequently in ICU between bedside nurses, TL nurses and Nurse Unit Managers. While there is published research regarding ICU bedside nurses’ handover (Spooner, Chaboyer, Corley, Hammond, & Fraser, 2013), little is known about TL handover.
in the ICU. TL are responsible for the coordination and management of care for multiple critically ill patients. TL liaise with all members of the multidisciplinary team, supervise care provided by nurses at the bedside and ensure staff are supported and deliver a high standard of care. It is imperative that TL shift-to-shift handover is detailed, structured and informative to maintain patient continuity and safety throughout the patient’s stay in ICU.

1.4 Research aims

The aims of this three-phase prospective interventional study were to determine the current content of TL handover (Phase 1), identify key items to include in a minimum dataset (MDS) for TL handover (Phase 2) and to implement and evaluate an electronic minimum dataset (eMDS) for nursing TL shift-to-shift handover (Phase 3). This study provides a platform for other researchers to devise evidence-based tools for ICU TL nursing handover to improve communication and accountability for patient care and reduce adverse events associated with miscommunication at handover.

1.5 Significance of the research

Identifying gaps in the handover literature led to the development, implementation and evaluation of an intervention to address these gaps, improve communication practices, decrease the absence of critical patient information and ultimately improve future handovers. This study is significant for three reasons; including to 1) improve handover communication, 2) improve patient care and reduce adverse events and 3) improve handover education and training.
1.5.1 Improving handover communication

Handover communication is a key requirement to maintain continuity of care, and quality care and patient safety in complex work settings such as ICU (Gregory, Tan, Tilrico, Edwardson, & Gamm, 2014; Pfrimmer, Johnson, Guthmiller, Lehman, Ernste, & Rhudy, 2017). Shift-to-shift handovers require the communication of technical and relevant information (vital sign trends, laboratory results, ventilator settings) about patient conditions, recommendations and plans for the following shifts. They involve two-way communication, which enables the oncoming TL to ask clarifying questions received at handover. Work constraints, such as reduced shift overlap times and shorter shifts have led to the development of new methods (e.g. phone and email handovers to oncoming staff) to communicate patient information at handover, which may not be reliable (Hoskote et al., 2017). This research identified the content of information that should be transferred at handover to inform an eMDS developed for TLs in ICU, to promote the handover of critical patient information. This had the potential to lead to improved communication, preparing oncoming nurses to better manage patients, leading to improved patient care and outcomes.

1.5.2 Improving patient care and reducing adverse events

The complex and multidisciplinary nature of the ICU environment renders it susceptible to medical errors. Failures in communication, particularly those related to handovers between clinicians, are common factors that contribute to the occurrence of adverse events (Starmer, Spector, Srivastava, West,
Rosenbluth, Allen et al., 2014). Inadequate communication during handover can result in incorrect medications being administered to patients (Hohenstein, Fleischmann, Rupp, Hempel, Wilk, & Winning, 2016), delays or failure to provide treatment (Ahmed, Mehmood, Rehman, Ilyas, & Khan, 2012; Lillibridge, Botti, Wood, & Redley, 2017), unnecessary repetition of diagnostic tests (King, Gilmore-Bykovskyi, Rooland, Polnaszek, Bowers, & Kind, 2013) and preventable readmissions (Ahmed et al., 2012; King et al., 2013). These failings waste time, and more importantly can cause harm to patients resulting in longer hospital stays, increased mortality and increased use of healthcare resources (King et al., 2013). Handover resources specific to high-risk environments like the ICU are needed to improve patient care and reduce adverse events. This research will lay the foundation for future research to determine whether a standardised eMDS to improve communication during TL handover reduces adverse patient events and improves patient outcomes.

1.5.3 Improving handover education and training

Despite a growing body of research in clinical handover, there is no uniform or standardised training method to equip clinicians with essential handover skills for use in healthcare settings (Reimer, Alfes, Rowe, & Rodriguez-Fox, 2018; Riesenberg, Leitzsch, & Cunningham, 2010). Currently, undergraduate degrees provide limited training in handover; nor is adequate training provided during job orientations; or continued professional development in healthcare settings, to equip nurses with the skills to deliver effective handovers (Reimer et al., 2018). Instead, clinical handover is learned in the workplace through the observation of
peers and mentors; this can result in variability of handover content and compromise patient care (Scovell, 2010). Further, research is required to support the development and implementation of handover training resources in universities and healthcare facilities to improve communication practices during handover (Murphy, Karpinski, Messer, Gallois, Mims, Farge et al., 2017; Reimer et al., 2018). This research utilises evidence-based strategies to develop an education program for implementing an eMDS for nursing TL handover, which has the potential for adaptation to other ICUs.

This aims of this research is to improve communication during TL shift-to-shift handover, potentially reducing adverse events associated with miscommunication during handover and equipping senior nurses with the skills necessary to competently hand over critical patient information and optimise patient care.

1.6 Summary

A description of clinical handover, including a brief overview of issues and knowledge deficits in current handover literature, has been provided in this chapter. The significance of this research for the healthcare industry has also been discussed. Chapter two provides a critical review of the literature in relation to current handover practices in healthcare (handover types, handover tools and other factors), and the need for further research in this area. The methodology of the research is outlined in chapter three and includes a detailed overview of the research aims, data collection methods and the analytical strategy used in each phase of the research to answer the research questions. Ethical considerations
are also addressed. The results of each phase have been summarised and presented as five publications in chapter four. In the final chapter, the overall findings and significance of the research are explained. Recommendations for education, research and practice are made and research conclusions are outlined.
CHAPTER 2: Literature review

2.1 Introduction

Clinical handover occurs frequently in health care facilities, in various formats, by multiple professional groups. Clinical handover involves transferring acceptance of patient care responsibility from one caregiver to another caregiver/s by passing on patient-specific information (Joint Commission on Accreditation of Healthcare Organizations, 2012). Quality handover enables clinicians to maintain continuity of care despite staff changes, recognise changes in patient needs quickly, and to anticipate and manage risks promptly, ensuring patients receive optimal care (Birmingham, Buffum, Blegen, & Lyndon, 2015). Therefore, it is imperative that handover information is accurate, up to date and informative.

2.2 Background

Previously, handovers have lacked structure. This has led to variation in the structure and content of handovers and potentially unreliable information being exchanged (Manser & Foster, 2011). It is not surprising that communication failures during handover are prevalent and can lead to prolonged hospital stays, a lack of continuity of care, suboptimal patient flow, readmissions, duplication of services, and patient dissatisfaction (Blouin, 2011; McMurray et al., 2011). In the past decade, in an effort to improve patient safety, the improvement of communication during handover has been listed as a top priority worldwide (Gosbee, 2010). As a result, various international governing bodies such as the ACSQHC and The Joint Commission have introduced handover standards that healthcare facilities must adhere to. Furthermore, a wealth of research has been generated focusing on various aspects of the handover
process such as handover methods (face-to-face and audiotaped), handover tools (checklists, mnemonics, minimum datasets, written and electronic tools), and the handover context (organisational context, interruptions, and education and training).

Despite developments in this important area, handover resources have been tailored toward ward areas and are lacking in critical care areas such as the ICU. Handovers in the ICU differ from ward handovers due to the complexity of patients, the higher staff to patient ratio, and the frequency of treatments and therapies that patients receive. Handovers occur in an event-driven, time pressured environment, and nurses rely on information received during handover to guide the care of critically ill patients. Recently, Spooner and colleagues (Spooner et al., 2013) provided insight into ICU bedside nurse handover, however there is currently no evidence-based resources to support TL nursing handover in the ICU. The TL role has an enormous responsibility in ICU - to coordinate and oversee the care of multiple critically ill patients. Handover communication in ICU remains a safety concern and further research is urgently needed.

This literature review provides a critical review of current nursing shift-to-shift handover processes, including handover methods, tools and other factors that impact the quality of handover in hospital settings. This information informs the development of an evidence-based eMDS for nursing TL handover in the ICU to improve communication and the quality of handovers. Gaps in the current handover literature are identified and recommendations for future research are made.
2.3 Data sources

The following databases were searched: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medical Literature Analysis and Retrieval System Online (MEDLINE), Google Scholar and reference lists from the published work of contemporary scholars were also consulted. Keywords searched were: ‘handover’, ‘handoff’, ‘hand over’, ‘hand off’ and ‘handoff (patient safety)’. Additional searches of subsets were replicated which included handover in ICU – ‘intensive care unit’, ‘intensive care’, ‘ICU’, ‘critical care’; handover methods – ‘face-to-face’, ‘verbal’, ‘bedside’, ‘office’ and ‘audiotaped’; handover tools – ‘handover tool’, ‘checklist’, ‘mnemonic’, ‘minimum dataset’; ‘written’, ‘electronic’ and other factors – ‘education’, ‘interruptions’ and ‘organizational culture’ or ‘culture’. The search was originally limited to January 2003 – December 2013 and was later re-run and updated from January 2014 - February 2018. The search was limited to the English language, peer-reviewed journals (research articles, systematic reviews) and government reports. Papers relating to shift-to-shift handovers in hospital settings were included; other handover types (inter- and intra- hospital transfers, meal breaks) outside hospital settings (primary care, community) were excluded.

2.4 Nursing shift-to-shift handover

There are various methods nurses use to carry out shift-to-shift handover. Nursing handover is commonly carried out verbally (face-to-face or audiotaped) in various locations. It can happen contemporaneously in an office, at the bedside, or retrospectively as with an audiotaped handover (Bakon et al., 2017). Over the last
decade a growing evidence-base has led to the development and revision of various handover methods (Birmingham et al., 2015).

Traditionally, nursing handovers were conducted verbally in a face-to-face format, located away from the bedside (i.e. meeting room, office, nurses station), and involving one or more nurses. Conducting handover away from the bedside was a way for nurses to remove themselves from the busy clinical environment to hand over in a quiet room, free from interruptions. It also enabled the nurse receiving handover to interpret and digest the information received (Johnson & Cowin, 2013). These handovers however were criticised for being too lengthy, inconsistent, inadequate, ritualistic, unprofessional and containing subjective patient information (Kerr, Lu, & McKinlay, 2013). This method did not allow the oncoming nurse to observe the patient and validate information at the bedside.

As a result, there has been a shift towards verbal handover conducted at the bedside and sometimes involving the patient and/or family (Anderson, Malone, Shanahan, & Manning, 2015b; Mardis, Mardis, Davis, Justice, Riley Holdinsky, Donnelly et al., 2016; Redley, McTier, Botti, Hutchinson, Newnham, Campbell et al., 2018; Tobiano, Chaboyer, & McMurray, 2013). This approach allows patients to be included in handover and for nurses to address patient concerns in real time. Bedside handover also provides an opportunity for the oncoming nurse to develop a deeper understanding of the patient’s condition. Bedside handover promotes situational awareness, whereby the oncoming nurse can assess the patient’s current environment, conduct safety checks, ask questions and identify discrepancies prior to commencing their shift (Chaboyer, McMurray, Johnson, Hardy, Wallis, & Sylvia Chu, 2009; Halm, 2013).
Positive findings have been reported as a result of implementing verbal handover at the bedside (Chaboyer, McMurray, & Wallis, 2010b; Jeffs, Acott, Simpson, Campbell, Irwin, Lo et al., 2013; Mardis et al., 2016). Nurses found that patient presence during handover prompted outgoing nurses to remember information to be passed on, and provided an opportunity for the oncoming nurse to engage with the patient, and to seek clarification through encouraging patient involvement thus bolstering the nurse-patient relationship (Bradley & Mott, 2014; Chaboyer et al., 2010b; Kerr, Lu, & McKinlay, 2014a). The use of bedside handover may account for an increase in nurses' perceived accuracy, improvements in patient safety, efficiency and teamwork, as well as enhanced patient-centred care (Mardis et al., 2016). As a result, patients and families reported feeling more informed (Kerr, McKay, Klim, Kelly, & McCann, 2014b) and involved in care (Jeffs, Beswick, Acott, Simpson, Cardoso, Campbell et al., 2014; Lu, Kerr, & McKinlay, 2014), and that staff helped them understand their condition (Reinbeck & Fitzsimons, 2013) through better communication (Reinbeck & Fitzsimons, 2013; Sand-Jecklin & Sherman, 2014).

The involvement of patients and families in handover also improves health literacy enabling patients to access, understand, appraise and apply information to their own health, and to make informed decisions (ACSQHC, 2014). Increased patient participation in handover has also been associated with decreases in healthcare utilisation (Bertakis & Azari, 2011) and reduced adverse events (Weingart, Zhu, Chiappetta, Stuver, Schneider, Epstein et al., 2011). Despite these findings, patient and family participation in handover is variable, ranging from minimal to high input (Anderson et al., 2015b; Chaboyer et al., 2010b).
While there are many benefits associated with verbal, bedside handovers, frequent interruptions have been reported using this approach (Kerr, Lu, McKinlay, & Fuller, 2011; Riesenberg et al., 2010; Tobiano, Whitty, Bucknall, & Chaboyer, 2017). Perceptions that bedside handover will lengthen handover time (Tobiano et al., 2017) and difficulties associated with the discussion of sensitive or confidential information have been described (Bruton, Norton, Smyth, Ward, & Day, 2016; Kerr et al., 2014a). However, research has indicated that patients and families are not as troubled by the discussion of sensitive information at handover as nurses (Kerr et al., 2014b; McMurray et al., 2011; Tobiano, Bucknall, Sladdin, Whitty, & Chaboyer, 2018; Tobiano et al., 2013; Whitty, Spinks, Bucknall, Tobiano, & Chaboyer, 2017). It should be considered that different findings may emerge using a larger sample or from a smaller hospital, where patients are more likely to know one another (McMurray et al., 2011).

Engaging patients and families at the beginning of their hospital stay to establish their preferences around the discussion of sensitive information at handover, their level of involvement, and their desire to be present during handover, would assist nurses to tailor individual patient approaches to bedside handover (Whitty et al., 2017). To date the standard of research on bedside handover outcomes are poor (Sherman, Sand-Jecklin, & Johnson, 2013; Staggers & Blaz, 2013). This is due to small-scale studies with no comparison group, implementation of multiple simultaneous interventions, which pose difficulties for measuring outcomes (Mardis et al., 2016) and the use of self-reported data (Mardis et al., 2016). Further research is needed to assess how verbal bedside handover contributes to improving patient outcomes.

Another form of verbal handover - audiotaped - is retrospective. Audiotaped handovers take place towards the end of a shift and involve the outgoing nurse
recording handover information in a room separate to the patient. The oncoming nurse receives the handover by listening to the audio recording. This type of handover was introduced as a cost cutting strategy to combat lack of shift overlap during rostering constraints. It was also used as a strategy to allow handover to occur in a quiet, non-interrupted environment (O’Connell & Penney, 2001; Staggers & Jennings, 2009). While it was reported that recorded handover was less time consuming and more factual (O’Connell & Penney, 2001; Staggers & Jennings, 2009), several safety concerns have been identified with its use. First, there was often a time gap from when the handover was recorded to when it was listened to, which led to out of date information passed on as well as loss of critical information during the time elapsed (O’Connell & Penney, 2001). Second, oncoming nurses’ were unable to clarify or seek additional information to fill in any gaps as the outgoing nurse had left the hospital by the time the oncoming nurse received handover (Streeter & Harrington, 2017). Audiotaped handover raised many patient safety concerns and, as a result, is not commonly used today (Staggers & Jennings, 2009).

It is evident that verbal handover is essential to transfer important patient information from one care provider to another. While there are many benefits associated with this technique, verbal handover alone may not be adequate to provide an informative handover. Misinterpretation of information may occur during verbal handover due to a number of variables, including staff accents, the use of jargon and abbreviations (Johnson & Cowin, 2013; Riesenberg et al., 2010). Further to this, there is no evidence that a handover has taken place (i.e. no sign off mechanism) or a record of what information has been transferred to the oncoming nurse. Relying on verbal handover alone may result in a loss of important information and an inability to carry out or complete outstanding tasks for the patient, therefore compromising patient
safety. Additional work is urgently needed to address these gaps in the literature to optimise verbal handover practices between nursing TLs.

2.5 Handover tools

Until recently there has been little consensus about the format or content of information that should be exchanged at handover (Starmer, Schnock, Lyons, Hehn, Graham, Keohane et al., 2017). As a result, information is passed on using a variety of sources (i.e. progress notes, care plans, observation charts), often repeated, lacks structure, contains irrelevant details and is inconsistent among clinicians (Abraham, Kannampallil, Brenner, Lopez, Almoosa, Patel et al., 2016; Benham-Hutchins & Effken, 2010; Benson, Rippin-Sisler, Jabusch, & Keast, 2007). Variation of handover content has the potential to result in significant loss of information and may lead to adverse patient events (Croos, 2014; Halm, 2013; Kerr, Klim, Kelly, & McCann, 2016).

In an effort to improve current handover processes, The New South Wales Department of Health released the ‘Key Principles of Clinical Handover’, the ACSQHC published the ‘OSSIE guide to clinical handover improvement’ (ACSQHC, 2010b) and The Joint Commission introduced handover strategies and processes (Abraham et al., 2016). Strategies included using handover tools such as standardised handover forms that use structured checklists, mnemonics and/or MDS. These handover tools provide a standardised format to assist clinicians structure the content of information being handed over (ACSQHC, 2010b; Heilman, Flanigan, Nelson, Johnson, & Yarris, 2016). While a number of these resources have been implemented in healthcare settings, there remains a lack of consistency in their adoption and use (Abraham, Kannampallil, & Patel, 2014b). Popular handover tools are reviewed in the following section.
2.5.1 Checklists

Checklists or check-off lists provide essential processes or instructions for completing a task such as handover (Hilligoss & Moffatt-Bruce, 2014). They have been used to remind clinicians to reinforce communication (Nakayama, Lester, Rich, Weidner, Glenn, & Shaker, 2012), to document progress toward desired objectives, and to provide important feedback on the achievement of system goals (Nakayama et al., 2012). They have also been used as teaching aids to provide new clinicians with a list of information to include in handover (Wayne, Tyagi, Reinhardt, Rooney, Makoul, Chopra et al., 2008). While the use of checklists during procedures have assisted in the reduction of central line infections (Pronovost, Needham, Berenholtz, Sinopoli, Chu, Cosgrove et al., 2006), and surgery-related complications and mortality (Haynes et al., 2009), they do have limitations.

Checklists are more suited to procedural tasks as they can be broken down into a series of steps. However, complex problems such as handover are difficult to break down into parts. The handover process involves multiple factors that interact together, requiring nurses to also consider critical thinking and decision-making processes. While a checklist can be used as a guide to ensure the clinician includes specific content in handover, a checklist is not sufficient to support the advanced cognitive processing necessary to bring sense to critical information, and to ensure information is presented in a meaningful way at handover (Hilligoss & Moffatt-Bruce, 2014). Caution should be exercised when implementing checklists into clinical handover practices, as high-quality evaluations of the effectiveness of checklists are diverse, have used small sample sizes and are limited (Boyd, Wu, & Stelfox, 2017; Riesenberg et al., 2010).
2.5.2 Mnemonic handover models

Mnemonics are another type of handover tool commonly used, and were developed to create a common language among clinicians when transferring information at handover (Gibney, Lee, Feczko, & Aquino, 2017). Effective mnemonics are catchy, symbolic, parsimonious, and utilitarian and may conjure up a visual image linked to a process or subject thus acting as a memory aid (Starmer, Spector, Srivastava, Allen, Landrigan, Sectish et al., 2012). These tools assist clinicians organise large amounts of information and convey complex patient issues using an informative, standardised and succinct format. Mnemonic handover models have also been shown to enhance efficiency and reduce miscommunication incidents during handover (Redley, Bucknall, Evans, & Botti, 2016; Vardaman, Cornell, Gondo, Amis, Townsend-Gervis, & Thetford, 2012). Several mnemonics have been established and are used internationally, with examples displayed in Table 1.

<table>
<thead>
<tr>
<th>Mnemonic</th>
<th>Description</th>
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<tbody>
<tr>
<td>SBAR</td>
<td>Situation-Background-Assessment-Recommendation</td>
</tr>
<tr>
<td>ISBAR</td>
<td>Identify-Situation-Background-Assessment-Recommendation</td>
</tr>
<tr>
<td>iSoBAR</td>
<td>identify-Situation-observations-Background-Agreed plan-Read back</td>
</tr>
<tr>
<td>I-PASS</td>
<td>Illness severity-Patient summary-Action list-Situation awareness and contingency planning- Synthesis by receiver</td>
</tr>
<tr>
<td>SHARED</td>
<td>Situation-History-Assessment-Risk-Expectation-Documentation</td>
</tr>
</tbody>
</table>

A systematic review identified 24 different handover mnemonics available for clinicians to implement in healthcare settings (Riesenberg et al., 2010). One of the most commonly used mnemonics, SBAR (Situation-Background-Assessment-Recommendation) was first employed in the US Navy in high-reliability situations, where errors had disastrous consequences, including loss of life (Foster & Manser,
The success of the tool in standardising communication in high stress environments led to its adoption in other settings including healthcare. Implementation of SBAR in one medical centre was associated with substantial reductions in adverse patient events (from 90 to 40 per 1000 patient days) and adverse drug events (from 30 to 18 per 1000 patient days) (Haig, Sutton, & Whittington, 2006). The results from this study led to the rapid spread of SBAR across hospitals and prompted a series of studies examining its effectiveness (Clark, Squire, Heyme, Mickle, & Petrie, 2009; Randmaa, Martesson, Leo Swenne, & Engstrom, 2014).

The SBAR mnemonic however, was criticised by Starmer et al (2012) for being limited in its application to complex patients, as it did not facilitate the communication of detailed information about critically ill patients and was more suited to time limited environments that required summaries of patients to make quick decisions. The limitations of SBAR led Starmer and colleagues (2017) to carry out a pilot study to develop an alternative mnemonic I-PASS (Illness severity-Patient summary-Action list-Situation awareness and contingency planning-Synthesis by receiver), with the intent to guide handover communication between resident physicians at shift-to-shift handovers in a Paediatric ICU (Table 1). The I-PASS handover tool was associated with improvement in the completeness and quality of handover communications and a reduction in interruptions without impacting handover duration and nursing workflow (Starmer et al., 2017). The I-PASS mnemonic has been implemented in several health care settings and more recently on a large scale in an academic hospital (Heilman et al., 2016; Huth, Hart, Moreau, Baldwin, Parker, Creery et al., 2016; Shahian, McEachern, Rossi, Chisari, & Mort, 2017). Others have also built on the SBAR mnemonic to include identifiers (ISBAR) or to vary the mnemonic and the content it represents (iSoBAR) (Porteous, Stewart-Wynne, Connolly, & Crommelin, 2009).
Although there have been several mnemonics developed since the Joint Commission’s National Patient Safety Goals (Haynes et al., 2009) were first issued, there is a lack of high-quality studies comparing the efficacy of different tools or evaluating their ease of use. The studies are mainly descriptive and have failed to use validated instruments or to link communication to patient outcomes (Bakon et al., 2017; Natafgi, Zhu, Baloh, Vellinga, Vaughn, & Ward, 2017; Riesenberg et al., 2010; Starmer et al., 2017). The large number of mnemonics also substantiates a lack of standardisation for their use (Nasarwanji, Badir, & Gurses, 2016; Riesenberg et al., 2010).

Until recently mnemonics have not been transferrable among different clinical areas and have not been suitable to use in the ICU. More recently there have been calls to develop handover tools that can be modified and adapted across different specialty areas like the ICU (Bakon et al., 2017). Further work is required to establish flexible mnemonics. Other options may include combining checklists and mnemonics to fulfil handover requirements for specific settings (Redley et al., 2016). This was demonstrated by Porteous and colleagues’ (2009) study that examined the mnemonic iSoBAR (identify-Situation-observations-Background-Agreed plan-Read back) along with a checklist containing tick boxes within each category of the mnemonic framework to conduct handover (Porteous et al., 2009). Staff considered the mnemonic and checklist to be easily adapted to their setting and integrated it into existing work processes to reduce duplication of paperwork and processes. It is important that nurses and researchers have a thorough understanding of the various handover tools available to ensure they choose the most appropriate tool or combination of tools to apply to their specialty areas.
2.5.3 Minimum datasets

The use of MDS is another strategy recommended by the ACSQHC (ACSQHC, 2010b) to improve handover practices and is increasingly used throughout healthcare. Like checklists and mnemonics, MDS provide a set of data items to be covered during handover. However, instead of using broad topics to guide clinical handover, such as is the case for checklists and mnemonics, MDS provide more detail and incorporate a specific set of data items to include within each broad category. This information is specific to the healthcare area using it (Welsh, Flanagan, & Ebright, 2010). There is increasing evidence that the utilisation of an MDS and a predetermined format encourages more effective handover and provides a shared mental model of the patient (Barnes, Campbell, Stockman, & Wunderlink, 2011; Johnson, Sanchez, & Zheng, 2016). Without this understanding, clinicians lose situational awareness (Halm, 2013). The implementation of standardised handover protocols such as an MDS has resulted in improvements in the quality of handover and teamwork, without increasing time needed to perform the handover (Catchpole, de Leval, McEwan, Pigott, Elliott, McQuillan et al., 2007).

Standardising the content of information at clinical handover by using an MDS has been linked with positive outcomes at shift-to-shift handover (Halm, 2013). These outcomes include improved clinical performance, clinicians reporting greater knowledge of patients, fewer technical errors, higher satisfaction amongst clinicians and patients, improved patient safety and lower costs to the healthcare system (Halm, 2013). There is however concern that detailed procedural rules may be too rigid to support human performance in critical situations like the ICU, where strong but flexible guidance is needed. Furthermore, there is a lack of systematic research supporting the
use of MDS within specialty areas such as the ICU. This requires further investigation (Manser & Foster, 2011; Riesenberge et al., 2010).

2.5.4 Written handover forms

Safety concerns have been raised with the use of verbal handover as the sole method for handover (Bhabra, Mackeith, Monteiro, & Pothier, 2007; Drach-Zahavy & Hadid, 2015; Holly & Poletick, 2014). Written tools (paper, electronic) have been identified as a solution to support verbal handover and promote better retention of information (Johnson & Cowin, 2013; Riesenberge et al., 2010; Staggers & Jennings, 2009). The use of written handover tools to conduct clinical handover is a method recommended by the ACSQHC (ACSQHC, 2012). Written handover tools generally involve using pre-prepared standardised forms that contain manually entered information about patients being transferred into the care of oncoming clinicians (Bhabra et al., 2007). These forms provide clinicians with a prompt for what information to include in a clinical handover (Chaboyer et al., 2010b).

Although handover forms can assist to improve communication and retention of information, concerns have been raised with their use. Handover forms are not routinely filed in patient charts, making it difficult to ascertain if handover occurred or what information was handed over between clinicians (Johnson et al., 2016). Handover forms require regular updates to ensure current information is passed to the oncoming clinician, which may be difficult to maintain in busy healthcare areas. Furthermore, staff are required to individually annotate written handover forms which may lead to incomplete information as well as an increased risk for errors to occur (Raptis, Fernandes, Chua, & Boulos, 2009).
Electronic handover tools are increasingly being adopted by clinicians in healthcare facilities as a possible strategy for improving handover communication and reducing handover related patient safety issues (Schuster, Jenq, Thung, Hersh, Nunes, Silverman et al., 2014). Recently, electronic clinical information systems (CIS) containing applications for electronic clinical handover have been introduced. With the introduction of CIS, several healthcare areas have developed electronic versions of handover forms containing information that has been auto-populated from sources within the system. Electronic handover tools have been shown to increase efficiency, adherence to handover protocols and in clinicians finishing work on time, and reduce time spent handwriting notes, and the duration of handovers and ward rounds (Abraham, Kannampallil, & Patel, 2014a; Alhamid, Lee, Wong, Chuah, Wong, Narasimhalu et al., 2016; Balka, Tolar, Coates, & Whitehouse, 2013; Cheng, Liddle, Mailes, & South, 2017). The successful use of electronic tools for handover however, relies heavily on an efficient information technology (IT) infrastructure and support team.

There are many potential benefits of using CIS for handover; however, research in this area is in its infancy. Currently, there is a limited body of work evaluating electronic clinical handover tools, their impact on communication at handover, patient outcomes, hospital length of stay, and mortality. While a reduction in adverse patient events has been reported with electronic handover tool use, clinicians have suggested electronic handover tools increase their workload due to the time spent updating the tool (Davis, Riesenber, Mardis, Donnelly, Benningfield, Youngstrom et al., 2015). These findings indicate a lack of integration between CIS, which should automatically upload data into the tool. This increases the risk of missing information, inaccurate data and the inability to maintain an up-to-date tool (Abraham et al., 2014a;
Barnes et al., 2011; Hoskote et al., 2017; Nabors, Khera, Forman, Kolte, Mittal, Marballi et al., 2016; Oakley & Hunter, 2017; Palma, Sharek, & Longhurst, 2011). Electronic CIS need to be linked so that information can be populated from multiple sources into one document such as a handover form. The ability to aggregate data across systems negates the need to manually input information, and avoids duplication of information and the potential for error (Nabors et al., 2016). Furthermore, the CIS should either incorporate a portable electronic device (Motulsky, Wong, Cordeau, Pomalaza, Barkun, & Tamblyn, 2017) that contains handover content, or a printable handover form that facilitates the bedside handovers of multiple patients (Barnes et al., 2011; Cheng et al., 2017; Vawdrey, Stein, Fred, Bostwick, & Stetson, 2013).

Although there are foreseeable benefits associated with incorporating electronically generated written information, there are several principles to consider when adopting this method to conduct handover. Clinicians should be included in the design and development phase of an CIS, to ensure key components of handover information are incorporated and specific healthcare needs are met (Alhamid et al., 2016; Hoskote et al., 2017). Additionally, electronic clinical handover needs to be user friendly, accessible, able to relay important information, save time and be practical (Barnes et al., 2011; Cheng et al., 2017).

It is evident that a variety of handover tools already exist however, there is wide variation in the efficacy of their use (Lee, Cumin, Devcich, & Boyd, 2015). For instance, during a simulation exercise, which examined five handover cycles carried out by senior medical officers, verbal handover alone was associated with only 33% retained information. This improved to 92% with the addition of note-taking. Retention rates increased to about 100% when verbal handover was accompanied by a printed
handover form with only one percent of information lost after five handovers (Bhabra et al., 2007). Inconsistent with these findings, a 2015 study, which used a randomised, single-blind, controlled experiment in various clinical settings across three metropolitan hospitals, found no difference in the transmission of information between nurses conducting purely verbal handover or those using a combination of verbal and written handover forms (Lee et al., 2015). These variances may have been attributable to discrepancies between simulated and actual clinical environments. Further experimental design is required to determine the most effective handover tools for enhancing communication and optimising patient outcomes in healthcare settings.

Since the ACSQHC’s initiative to improve handover practices, handover methods (face-to-face, audiotaped) and handover tools (checklists, mnemonics, MDS, paper or electronic) have been developed and introduced into various healthcare settings. A written or electronic handover tool to accompany verbal handover is recommended to provide clinicians with a prompt for content inclusion in handover, and to improve communication and retain information. Electronic handover tools require streamlined systems that can draw information from multiple sources, eliminating the need for manual updates and the potential for errors. Electronic handover information should also be available on portable devices, or in a printed format to facilitate bedside handover. Currently there is confusion regarding which tool to adopt due to a lack of universal standardisation. Further research is required to clearly define and validate the use of these tools and their impact on patient outcomes.
2.6 Factors that influence handover

Research to date has focussed on the content and location of handover, however handover is multidimensional, and the quality of information transferred at handover may be influenced by other factors such as the handover context (Blouin, 2011). Three main factors that may influence handovers are organisational culture, the frequency of interruptions during handover, and the education and experience of the clinician involved in handover.

2.6.1 Organisational culture

Currently there is a limited body of work examining the influence of organisational culture on clinical handovers in healthcare settings (Benjamin, Hargrave, & Nether, 2016; Richter, McAlearney, & Pennell, 2016). Organisational culture is the social behaviour and underlying shared values, beliefs, assumptions, and norms of health care providers in an organisation, department or profession (Hesselink, Vernooij-Dassen, Pijnenborg, Barach, Gademan, Dudzik-Uraniak et al., 2013; Siemsen, Madsen, Pedersen, Michaelsen, Pedersen, Andersen et al., 2012). Small studies have identified that handover is perceived by staff to be a mundane chore that is carried out in addition to real work. Nurses have also reported feeling forced to rush through handover due to leaders not valuing the handover process and failing to allocate sufficient time or adequate staffing levels to handovers (Jorm, White, & Kaneen, 2009; Meissner, Hasselhorn, Estryn-Behar, Nezet, Pokorski, & Gould, 2007; Riesenborg et al., 2010; Riesenborg, Leitzsch, Massucci, Jaeger, Rosenfeld, Patow et al., 2009; Steyrer, Schiffinger, Huber, Valentin, & Strunk, 2013).
A lack of organisational support of handover can lead to complacency with current practices, with little recognition of the high-risk nature of handover. Lack of engagement in handover was evidenced by a Danish study exploring clinician attitudes and experiences towards handover from various departments in a large university hospital (Siemsen et al., 2012; Steyrer et al., 2013). Health professionals generally did not explicitly focus on handovers and were not aware of handover as a clinical risk activity. The culture in this setting included incomplete introduction and supervision of new staff and lacked recognition and awareness that handover situations could be used as teaching and learning opportunities (Siemsen et al., 2012). Consequently, clinicians accepted this culture and did not make improvements to their practices. Alternatively, Nelson and colleagues (2017) found that engaging users in the creation and development of an electronic sign out tool (eSignout), fostered better interdepartmental relationships, prompted positive teamwork across departments and led to positive perceptions of handover and successful implementation of the handover tool (Nelson, Bell, Nathanson, Sanchez, Fisher, & Anderson, 2017).

Aside from lack of awareness towards safe and effective clinical handover practices, sub-cultures have been identified among clinicians from different disciplines. Healthcare areas often have separate “professional tribes” (e.g. medical, nursing, physiotherapy etc) with different values and beliefs which can be incompatible with each other and can threaten the effectiveness and safety of patient transitions (Hesselink et al., 2013). Furthermore, the content of information transferred at handover can differ greatly between professional groups. Differences in handovers were demonstrated in a study by Miller et al. (2009) which showed that nurses readily relayed information about interventions while physicians spoke about diagnoses and expectations (Miller, Scheinkestel, Limpus, Joseph, Karnik, & Venkatesh, 2009a).
While individual factors come to bear on clinical handover, it is the inter-relationship of these factors within a socio-cultural organisational and environmental setting that are most significant, and have the potential to impact patient safety (Wong, Turner, & Yee, 2007).

The current body of work relating to organisational culture and clinical handover is primarily limited to perceptions about the quality of handover. To improve handover processes in healthcare settings it is essential that leaders create an organisational culture that values safety and provides adequate resources to promote effective handover practices. Richter and colleagues (2016) found a strong association between perceptions of successful handovers and teamwork when hospital leadership demonstrated safety as a priority. This highlights the need to raise awareness, and to provide additional training and learning resources to leaders to foster safety cultures in healthcare settings. While many studies focus on the users during the knowledge translation process, further work is required to engage leaders to support staff, and assist with embedding changes into practice. An organisation that cultivates a safety culture will lead to improved handover practices and better outcomes for patients (Richter et al., 2016).

2.6.2 Interruptions

There is a wealth of literature acknowledging interruptions to be frequent during clinical handover (Birmingham et al., 2015; Myers, McCarthy, Whitlatch, & Parikh, 2016; Spooner, Corley, Chaboyer, Hammond, & Fraser, 2015). Interruptions occur when there is a break in the performance of a human activity, initiated by an internal or external source (Brixy, Robinson, Turley, & Zhang, 2010; Runciman, Hunt,
Hannaford, Hibbert, Westbrook, Coiera et al., 2012). This break results in a momentary suspension of the initial task with the assumption that the initial task will be resumed (Brixey et al., 2010). Much of the safety research suggests frequent interruptions during handover may lead to delays in recognising and communicating patient status changes (Estryn-Behar, Milanini-Magny, Chaumon, Deslandes, Fry, Garcia et al., 2014). It may also lead to loss of critical information during handover (Parker & Coiera, 2000), failure to complete or initiate clinical tasks (Westbrook, Coiera, Dunsmuir, Brown, Kelk, Paoloni et al., 2010) and the inability to provide quality patient care (McGillis Hall, Pedersen, & Fairley, 2010).

Although there is widespread awareness that interruptions are prevalent in healthcare areas, there is an absence of evidence to support a causal relationship between interruptions during handover and errors and undesirable patient outcomes (Grundgeiger & Sanderson, 2009; Hopkinson & Jennings, 2013; Li, Magrabi, & Coiera, 2012; McCurdie, Sanderson, & Aitken, 2017a). Conflicting views of interruptions have been reported regarding the need to reduce interruptions to improve patient safety, while others have suggested using interruptions to improve patient care.

Other studies have endeavoured to understand the types of interruptions that occur in healthcare settings and to categorise them into interruptions that benefit or impede care. Categories include patient-specific (positive, necessary), work-specific (nonurgent, unnecessary) or personal (unrelated to healthcare) interruptions (Myers et al., 2016; Rivera, 2014; Sasangohar, Donmez, Easty, & Trbovich, 2015a). A study examining interruptions in a cardiovascular ICU found interruptions to occur frequently, however most interruptions were determined to be positive, relating to tasks that indirectly affected the patient (Sasangohar, Donmez, Easty, & Trbovich, 2015b). Myers
and colleagues (2016) recommend that interruptions that add value to patient care during handover should be supported through process improvement efforts, while those considered to be detrimental to patient safety (personal or work-specific interruptions) should be challenged by continuous improvement strategies.

While eliminating interruptions in the workplace may not be the answer to improving patient safety, another strategy is introducing ‘protected time’ or interruption free time for clinicians during clinical handover. This strategy was shown to be effective in Sassangohar and colleagues’ study (2015), which identified a significant reduction in interruptions when a light-emitting diode (LED) was erected on top of the ICU room door, illuminating the words “do not disturb” during high-risk tasks. Furthermore, the findings indicated that clinicians delayed nonurgent interruptions when the light was illuminated until a more suitable time. This concept may also be effective during handovers (Sasangohar et al., 2015a). Alternatively, other studies have shown that clinicians develop resilience to interruptions over time and that further work should be carried out to build resilience, buffer consequences of interruptions and to develop skills to respond appropriately to interruptions (Anderson, Nicksa, & Stewart, 2015a; McCurdie et al., 2017a).

To date, much of the healthcare literature has been aimed at investigating interruptions in the nursing and medical professions in relation to completing clinical tasks in low, medium and high-risk situations, including medication administration and clinical handover. There is limited evidence examining interruptions during handover in the ICU and no evidence describing interruptions during nursing TL handover in the ICU. While interruptions may be associated with adverse events, they may also benefit patient care. Hopkinson and Jennings (2013) suggest that pre-existing beliefs and
biases are potentially influencing research in this area and resulting in conflicting outcomes. Prior to introducing interventions to reduce interruptions, research needs to focus on interruptions in different healthcare settings such as ICU, and establish what they are, why they occur, what kind or their nature, the functions they serve and the organisational challenges they create (McCurdie et al., 2017a; McCurdie, Sanderson, Aitken, & Liu, 2017b).

2.6.3 Education and experience

The evidence-base surrounding handover in healthcare is growing rapidly and has led to the development of a clinical handover NSQHSS, as well as the introduction of guidelines, protocols and toolkits to be used by health services to improve handover processes and patient safety (ACSQHC, 2010b; ACSQHC, 2012; ACSQHC, 2011; Joint Commission on Accreditation of Healthcare Organizations, 2012). Despite these advancements in handover, there are limited studies evaluating educational strategies to train clinicians in effective communication practices during handover (Blyth, Bost, & Shiels, 2017; Riesenberg, 2012).

Although there are recommendations to develop handover skills among undergraduate students, nurses and other clinicians in the healthcare sector, limited formal education in handover is provided (Scovell, 2010). Instead, clinical handover is learnt in the workplace via ‘osmosis’, through observing peers (Cleland, Ross, Miller, & Patey, 2009; Scovell, 2010). Subsequently, nursing students and junior clinicians report limited knowledge around what constitutes an effective handover, they have difficulty deciding what content to include or how to structure their handovers and lack
confidence when communicating information at shift changes (Cleland et al., 2009; Lancaster, Westphal, & Jambunathan, 2015).

While not specific to handover, there are several recommended education strategies that could be applied to handover education. These include: small group education sessions, using interactive and participatory approaches to develop critical thinking, decision making and problem-solving skills and the use of feedback to promote self-reflection and practice improvements (Gordon, 2013; Krenn, Wurth, & Hergovich, 2013; McWilliam, 2007). The incorporation of both interactive education and feedback was examined in Murphy and colleagues’ (2017) study that found the delivery of one-hour interactive workshops (overview of handover and pitfalls, watch and appraise simulated handovers, use case scenarios to deliver handovers to peers and gain feedback) to 41 junior doctors improved clinical judgement and communication. Junior doctors also reported improvements in confidence and handover skills. Furthermore, the education program was easy to implement and could be taught quickly (Murphy et al., 2017). Another study however, showed that education strategies competed with engrained cultures that did not promote handover training or acknowledge the importance of handover (Blyth et al., 2017). Consequently, no improvement in handover skills were seen.

An approach that is currently gaining momentum as an educational strategy is the use of role play or simulated real-life clinical handover scenarios (Cleland et al., 2009; Toghian Chaharsoughi, Ahrari, & Alikhah, 2014; Yu & Kang, 2017). The integration of role play into handover education modules has been shown to increase knowledge, effective communication and coping strategies in health experts in hospitals and other environments (Toghian Chaharsoughi et al., 2014). Furthermore,
nursing students that have received both instructional education and role play have shown greater improvement with handover skills than those who received instruction education alone (Kesten, 2011; Wang, Liang, Blazeck, & Greene, 2015; Yu & Kang, 2017). Simulation may also assist undergraduates to develop skills in teamwork, structured communication, situational awareness, assertiveness and critical language. Although these techniques may be useful in preparing junior clinicians, there are currently no studies that demonstrate handover education improves patient outcomes (Gordon & Findley, 2011).

Despite incorporation of handover education into some curriculums, a range of teaching and assessment methods are being used with limited theoretical underpinnings or conceptual frameworks to guide teaching methods. Currently there is no consensus on which handover interventions or processes improve patient safety, and educators are left with the dilemma of enhancing the undergraduate knowledge base with little evidence to guide their teaching (Gordon, 2013). While there are a variety of educational techniques that could be utilised in handover training, there remains a paucity of research supporting the use of universal educational interventions to improve handover among clinicians. Furthermore, studies that have reported improvements with handover communication following educational interventions, have used small sample sizes and conducted limited long-term follow up evaluating the benefits of education in this important area (Gordon, 2013; Gordon & Findley, 2011). It is essential that education programs targeting handover are implemented and evaluated in healthcare settings to develop clinicians' handovers skills, and to improve handover practices (Halm, 2013).
2.7 Gaps in the evidence

In the last decade there has been a wealth of research generated on handover practices. Subsequently, handover methods have been improved, several tools have been developed to standardise and structure handover information and other factors that impact handover (organisational factors, interruptions, education and training) have been examined. However, there are several gaps in the evidence that need to be addressed to improve communication practices during handover and to reduce adverse patient events. For example, the use of verbal, face-to-face handover at the bedside and handover tools to structure handover content have not been validated for use across healthcare facilities. So far, research in this area has been descriptive, with small sample sizes and long-term measures such as patient outcomes not being investigated. Until there is an understanding of current practices and potential problems with their use, these kinds of studies have a place in advancing the field. There has also been limited work carried out in critical care areas to develop resources specific to these complex environments. Handover is an extremely diverse process and there are multiple factors that influence the quality of information passed on between shift changes. Before we can study the effectiveness of handover interventions further research is necessary to understand current practice and the information requirements in specialised settings such as the ICU.

2.8 Summary

A critical review of current handover processes in relation to handover methods, handover tools and other factors that influence the quality of handover in healthcare settings has been provided in this chapter. Although there is a growing body of
evidence in this area, more in-depth studies are required to identify which handover strategies improve handover practices and patient outcomes. Also, further work is required to develop and evaluate strategies for specialised settings such as the ICU.

The following study aims to determine the current content of TL handover (Phase 1), identify key items to include in an eMDS for TL handover (Phase 2) and to implement and evaluate an eMDS for nursing TL shift-to-shift handover (Phase 3). Such an evaluation, has not previously been investigated.
Chapter 3: Methods

Since the WHO listed clinical handover as a top five priority area for patient safety, there is a growing body of evidence and resources available for improving handover practices (Gosbee, 2010). Despite advances in clinical handover, there remains a gap in the literature specifically focused on handovers in the ICU. This study focused on ICU TL nursing shift-to-shift handover. Team Leaders are responsible for the coordination and management of multiple critically ill patients, and effective handovers are crucial to maintaining continuity and a high standard of care. To date, there is no research investigating TL handover practices in the ICU. A detailed description of the methods that were used to investigate nursing TL shift-to-shift handover in the ICU is provided in this chapter.

3.1 Aims

The aims of this study were to determine the content of information handed over during ICU nursing TL handover, to identify the key components to include in a handover MDS and to examine the implementation and evaluation of an eMDS for nursing TL handover in the ICU. Specific research questions to guide the conduct of the study included:

1. What is the current content of ICU TL handover?
2. What data do nurses think should be handed over during TL handover?
3. To what extent do TLs use the eMDS to support handover?
4. Do the characteristics of interruptions during handover change following eMDS implementation?
5. What are TLs’ perceptions of an eMDS?

3.2 Study design

A three-phase prospective interventional study was carried out to examine ICU TL nursing handover. A modified version of the Knowledge-to-Action (KTA) framework was used to guide each phase of this research (Graham & Tetroe, 2010). The KTA framework is one of the most frequently used knowledge translation frameworks in healthcare (Nilsen, 2015). The framework assists to bridge the KTA gap by considering key mechanisms such as the local setting (Graham & Tetroe, 2010). The KTA framework was originally developed by combining existing planned action and change theories in the health sciences, social sciences, education and management fields into one framework aimed at improving health and healthcare (Graham & Tetroe, 2010). The framework directs attention to the ideal steps or categories of action that are believed to be important when attempting to implement change strategies (Graham, Logan, Harrison, Straus, Tetroe, Caswell et al., 2006; Graham & Tetroe, 2010), while also supporting collaboration between researchers and knowledge users throughout the process (Figure 1).
Researchers and clinicians highlight the challenges they face when translating knowledge into a healthcare setting (Bero, Grilli, Grimshaw, Harvey, Oxman, & Thomson, 1998; Braithwaite, Marks, & Taylor, 2014; Field, Booth, Ilott, & Gerrish, 2014) In the US and the Netherlands, early studies examining the use of evidence-based practice in healthcare settings found that approximately 30-40% of patients did not receive care according to scientific evidence, while 20-25% of care provided was not needed or was potentially harmful (Grol, 2001; Schuster, McGlynn, & Brook, 1998). Although several formal and informal strategies can be used to inspire practice change, various barriers within healthcare settings can hinder knowledge translation.
These barriers may be attributed to human factors such as negative attitudes toward research and/or organisational reasons, such as demanding workloads with no time to be involved in research activities (Houser & Oman, 2011; Plamondon & Caxaj, 2018). Incorporating systematic approaches through the integration of frameworks and theories provides a structure that assists healthcare professionals implement innovations successfully into healthcare settings (Graham & Logan, 2004; Haines & Donald, 1998; Plamondon & Caxaj, 2018).

3.2.1 Knowledge Creation

The triangle in the centre of the KTA framework symbolises the Knowledge Creation process, while the circle (Cycle) on the outside represents the activities or steps related to application of knowledge (usually requiring action by the potential users of the knowledge). Knowledge Creation is composed of three steps: knowledge inquiry, knowledge synthesis and the creation of knowledge tools (Graham & Tetroe, 2010). Knowledge Creation was established in the previous chapter (Literature review), providing a synthesis of the existing knowledge surrounding clinical handover and informing the Action Cycle.

3.2.2 The Action Cycle

The circle or Action Cycle outside the Knowledge Creation triangle frames what needs to be done, how to take action, and what circumstances or conditions need to be addressed when implementing change. The Action Cycle contains seven action steps that can occur sequentially or simultaneously throughout the cycle. The seven steps are: 1) identify the problem; 2) adapt knowledge to local context; 3) assess
barriers to knowledge use; 4) select, tailor and implement interventions; 5) monitor knowledge use; 6) evaluate outcomes; and 7) sustain knowledge use. At each step multiple strategies can be applied to guide the process (Graham & Tetroe, 2010).

Six steps of the Action Cycle informed the three phases of this research project. The first step of the Action Cycle, identify the problem, involved audiotaping nursing TL handovers to identify the content of handovers (Phase 1, Step 1). The second step of the Action Cycle, adapt knowledge to local context, involved conducting focus groups with TLs to identify components to include in an MDS for handover (Phase 2, Step 2). In the third step of the Action Cycle, assess barriers to knowledge use, TLs were surveyed to identify barriers and facilitators to the use of an eMDS during handover (Phase 3, Step 3). During the next Action step, select, tailor and implement interventions, strategies were selected to implement the eMDS (Phase 3, Step 4). Once all TLs received education about the eMDS, the handover tool was implemented into ICU over a three-month period. Three months was considered an adequate time frame to embed the practice change into TL handovers, and was based on previous published literature relating to knowledge translation strategies in healthcare settings (Grayson, Russo, Cruickshank, Bear, Gee, Hughes et al., 2011). The next step of the Action Cycle, monitor knowledge use, was carried out through an audit of TLs’ use of the eMDS during handover (Phase 3, Step 5) and, the final step, evaluate outcomes, was determined through surveying nurses’ perceptions of eMDS use (Phase 3, Step 6). Table 2 provides an overview of the KTA steps in relation to the phases of the research. And, while each published paper includes a very detailed description of the methods used in the phases, an overview of this information is also provided in this chapter.
Table 2 KTA steps that informed the phases of this research

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3.3 Setting

The study was conducted in a 21-bed (government funded) ICU, at a tertiary referral hospital specialising in cardiothoracic surgery, and other medical and surgical specialties, in Brisbane, Australia. Members of a multidisciplinary team including nurses, medical officers, physiotherapists, speech pathologists, dieticians and social workers managed the care of critically ill patients in the ICU. A Clinical Nurse Consultant and a Nurse Unit Manager were responsible for the clinical and managerial aspects of nurses in the ICU. There were 180 Registered Nurses (RNs) employed to work in the ICU including 63 RNs working in TL roles. The ICU consisted of three areas (ICU 1, ICU 2 and ICU 3), with ICU 1 and 2 each containing up to nine beds, while ICU 3 had three funded patient beds. The
nurse to patient ratio was 1:1 for ventilated patients and 1:2 for non-ventilated patients. Each ICU area was managed by a TL that was supported by one to two additional experienced nurses (also known as Assistance, Coordination, Contingency, Education, Supervision and Support Nurses [ACCESS] or float nurses) to assist with the coordination of patient care and maintenance of patient flow within that area. Team Leaders predominantly worked 12-hour shifts (0700-1930 or 1900-0730). Handovers between TLs occurred during the last 30 minutes of the shift at the central ICU desk with a maximum of nine patients discussed at each handover.

Prior to commencing this study, oncoming and outgoing TLs could choose from five different paper or printed electronic handover templates to deliver and receive handover within the three ICUs. There was no standardised tool, with various tools used in a single handover, depending on TL preference. Paper handover forms were updated by TLs each shift and included 1) the systems approach (neurological system, respiratory system, cardiovascular system, renal system, gastrointestinal system, skin system and social system) the cardiac surgical form containing cardiac specific information such as hourly cardiac drainage, pacing settings, extubation status etc and 3) a chronological list of relevant events or investigations that occurred during the patient’s hospital stay in ICU. Printed electronic handover forms included 4) a typed weekly medical summary containing objective data such as results of investigations and treatment plans documented by an ICU doctor and 5) a printed form from WardView containing patient details and information regarding patient issues and treatments received which was updated by TLs at their discretion.
3.4 Sample

Senior nurses working in TL roles (n=63), employed to work in the ICU at The Prince Charles Hospital (TPCH) were sampled for this study. The Clinical Nurse Consultant (CNC) forwarded an email from the PhD candidate to TLs notifying them about the study and process to participate in the study. The CNC provided the PhD candidate with a list of TLs and participant information sheets and consent forms for each phase of the study were sent via internal mail to all nursing staff working in TL roles in the ICU. Potential nursing participants were told about the study at staff meetings and written consent was obtained prior to study commencement. Nurses were given the choice to participate in one, two or three phases of the study. Consent was confirmed at each phase of participation.

3.5 Phase 1

3.5.1 Identify the problem

Prior to implementing new strategies into healthcare settings it is important to establish the KTA gaps or the knowledge needs of the population (Canadian Institutes of Health Research, 2016; Graham & Tetroe, 2010). To identify the current content of nursing TL handovers, and the knowledge gaps in handover content, nursing TL handovers were audiotaped.

3.5.2 Data collection

A total of 40 handovers (40 nurses giving handover, 40 nurses receiving handover), representing 63% of the TL population were recorded over 20 days. Forty audiotaped handovers resulted in 277 patient handovers, (approximately
seven patient handovers for each TL handover), which provided a broad overview of the current content of TL handovers. To reduce the chance of bias, a random number generator was used to randomly sample one TL handover from the three areas in the ICU during the night to day shift handover, between 0700 and 0730 or the day to night shift handover, between 1900 and 1930 from Monday to Friday. Handovers were audiotaped if the oncoming and outgoing nurse provided consent to participate, and if the TL conducting handover had not been previously recorded in Phase 1. If the TL conducting handover did not provide consent or had been audiotaped previously, the next randomly selected pair were approached and recorded. Prior to commencement of handover, consent was confirmed with the participant, demographic details were collected and the participant pressed record on the audio recorder as soon as handover commenced. Nurses receiving handover were recorded any number of times. The audio recorder was positioned on the central ICU desk where handover occurred. Team Leaders stopped the audio recorder once handover had concluded. Audiotaping is a method used by researchers to obtain complete and accurate data during TL handover. This technique also allowed the researcher to transport the data to more controlled settings to transcribe, code, analyse and interpret the content of information transferred during TL handover (Crabtree & Miller, 1999). Nurses participating in this study had previously been exposed to audiotaped handovers during a study examining bedside handover in the ICU (Spooner et al., 2013), thereby reducing the potential influence of the Hawthorne effect during the study. A case report form was used to collect characteristics of TLs during this phase. Data included age, nursing grade, handover shift, hours
worked per fortnight, number of patients handed over and length of time taken to perform shift handover.

3.5.3 Analysis

An experienced transcriptionist transcribed the audio recordings, then the transcripts were checked for accuracy by the PhD candidate by listening to each recording in full while reviewing the transcript. Transcripts were analysed using content analysis to gain an understanding of the current content of TL handover. Content analysis is used to create concepts or categories that describe phenomena and provide knowledge and new insights into areas where little is known (Elo & Kyngas, 2008; Feil, 2013; Vaismoradi, Turunen, & Bondas, 2013). Researchers are able to obtain content sensitive data (Krippendorf, 1980), and identify the meaning of communication (Cavanagh, 1997; Erlingsson & Brysiewicz, 2017) and critical processes using a flexible analytic strategy (Harwood & Garry, 2003). Deductive and inductive approaches to content analysis were used to examine the data (Hsieh & Shannon, 2005).

Deductive content analysis allows the researcher to retest existing theories (Hsieh & Shannon, 2005). In this research, deductive content analysis was used to test the ISBAR schema (Identify-Situation-Background-Assessment-Recommendation) (Haig et al., 2006). In the ‘Assessment’ data, the body systems approach (neurological system, respiratory system, cardiovascular system, renal system, gastrointestinal system, skin system and social system), which is frequently used to structure ICU handovers (McLaughlin, Antonio, & Bryant, 2004), were used as subcategories within the ISBAR schema (Refer to Appendix
Despite frequent use of these tools to guide handover in healthcare areas, their application to ICU is unknown. Codes that relate to ISBAR and the body systems were categorised according to these established models.

A quantitative approach was also used to identify the frequency of the *a priori* categories (ISBAR) and subcategories (body systems approach) that were discussed during handover. The analysis identified which information was frequently and infrequently handed over by TLs during handover.

Data that did not fit into this *a priori* coding framework were categorised inductively and were used to create additional categories based on the principles of inductive analysis (Hsieh & Shannon, 2005). An inductive approach assists the researcher to generate knowledge about handover content. This method involves coding, categorising and abstracting the data. The coding process consisted of reading and re-reading transcripts, and documenting codes in the margins to describe the content (Erlingsson & Brysiewicz, 2017). Next, the codes were organised into categories and data were abstracted. This process involved grouping subcategories with similar events and incidents together as categories and then grouping categories as main categories (Dey, 1993; Robson, 1993). Grouping the data reduced the number of categories by collapsing those that were similar or dissimilar into broader higher order categories (Erlingsson & Brysiewicz, 2017). Once these steps were completed, the data were abstracted and used to formulate a general description of handover content. This process produced new knowledge on the content of information included in handovers. These findings informed Phase 2 - assisting researchers to identify key concepts to include in an MDS for TL handover.
Finally, the PhD candidate listened to audio recordings and reviewed transcriptions to document the frequency, source and cause of interruptions occurring during nursing TL handover. Interruptions were categorised into patient-specific (interruptions that convey information relevant to overall patient safety) or personal and work-specific (e.g. tasks not related to the patient). Descriptive statistics were used to summarise the data, which were then presented as median, interquartile range, frequency and percentages. Details about the trustworthiness of the qualitative data is described in section 3.8.1.

3.6 Phase 2

3.6.1 Adapt knowledge to local context

The next step of the KTA framework involved adapting knowledge to the local context, or developing an intervention relevant and practical to the environment and clinicians using it (Canadian Institutes of Health Research, 2016; Rycroft-Malone, 2007). Results from Phase 1 informed the development of an MDS for nursing TL handover. Prior to developing the MDS, focus groups were conducted with TLs to identify content considered important for inclusion in an MDS.

3.6.2 Data collection and analysis

Following confirmed written and verbal consent, three focus groups (five to eight TLs in each group) were conducted. Characteristics of TLs were collected in this phase, including age, sex, nursing grade and hours worked per fortnight. Focus groups were approximately 90 minutes in length and occurred in a small room with space for participants to sit comfortably in a circle, to ensure the
researcher could maintain eye contact with participants throughout the session. The PhD candidate moderated the session, clarified the aims of the session and the purpose of participant contributions, ensured participants felt at ease, and facilitated interactions between participants. The moderator initiated discussion by asking open-ended questions and, exploring various meanings related to TL handover. She also kept the group focused and conversation moving (Gibbs, 1997). A Clinical Research Nurse was responsible for audiotaping the discussions and for observing the group and making field notes, which provided additional detail to the audio recordings (Bender & Ewbank, 1994). Participants were informed that they were being recorded and that items discussed during the session remain confidential.

Each focus group commenced with a presentation of Phase 1 findings and involved selecting and assembling individuals to comment on a subject related to the research (Kitzinger, 1995; Powell, Single, & Lloyd, 1996). Group interaction can assist participants to explore and clarify their views in ways that would be less accessible in one-to-one interviews. Focus groups are particularly beneficial when the researcher has a series of open-ended questions and wishes to explore issues related to clinical handover (Kitzinger, 1995). This method reveals information that often remains untapped by more conventional data collection methods. It enables the researcher to gain a large amount of information in a short period of time along with a diversity of views from the group (Gibbs, 1997). Furthermore, a group that collaborates cohesively is able to engage in problem solving, which can be an empowering experience (Kitzinger, 1995).

A disadvantage of these group dynamics is that the articulation of group norms may silence individual voices with varying opinions (Kitzinger, 1995). To
ensure all participants contributed during the sessions, a nominal group technique (NGT) (Keatinge, Tarren-Sweeney, Vimpani, & Callan, 2002) was used to structure and guide the focus groups. The NGT is a structured method, recognised as an efficient and effective methodology to generate and prioritise ideas and solutions for complex, ill-structured problems. In NGT, data are systematically collected from all participants, resulting in contributions from all, and reflecting divergent views. This technique is a structured variation of small group discussion methods. The process prevents the domination of discussion by a single person, encourages passive group members to participate, and results in a set of prioritised solutions or recommendations. The NGT assisted researchers in this study to determine the concepts for inclusion in an eMDS for an improved TL ICU handover.

Focus groups were structured using Keatinge and colleagues' NGT steps to generate data (Keatinge et al., 2002). These include:

1. Prior to the meeting, participants were given a handout containing a list of categories to discuss at handover, generated from Phase 1. Participants were asked to choose which items to include or remove in an MDS.
2. At the start of the NGT meeting, the purpose of the meeting and expectations of participants were discussed.
3. Next, a short overview of the findings from Phase 1 were presented.
4. Using a round robin technique (i.e. each participant takes a turn), participants were asked to share their responses from question one and list the most and least important categories to include in TL handover. These responses were documented on a white board by the second
researcher. The second researcher collated the responses, and identified the top ranked responses.

5. Participants were asked to take a moment to consider the responses.

6. Using a round robin technique, participants were asked to comment on the responses presented. The round robin continued until there was consensus amongst participants regarding which items to include and remove from TL handover.

7. Next, using a round robin technique participants were asked to suggest additional items that should be included in TL handover.

8. Responses were written on the white board and the second researcher collated top ranked responses.

9. Participants were asked to take a moment to consider the responses.

10. Using a round robin technique, participants ranked the items presented on the white board. Round robin continued until consensus was reached regarding new items to include in the handover MDS.

11. General discussion was used to clarify issues and discuss areas of divergence.

12. A final round robin ‘voting’ occurred to finalise the proposed content to include in the MDS.

An advantage of the NGT, over other techniques such as the Delphi (open-ended questions distributed to participants requiring written responses) (Wilkes, 2015), is that the face to face interactions in NGT allow rich discussion and debate to occur, sometimes termed ‘structured brainstorming’ (Asmus & James, 2005). This can generate new and innovative solutions and allows individual participants to be heard (Harvey & Holmes, 2012). Further, because it is a
structured approach to gain participant input, it prevents ‘social loafing’, described as individuals exerting less effort in a group than they would as individuals (Asmus & James, 2005). This technique has been successfully used in a wide range of circumstances where group processes and consensus are used to generate recommendations.

Descriptive statistics (i.e. median, interquartile range and mode) were used to analyse responses from the focus groups. Audio recordings and field notes from the meetings were utilised to clarify inconsistencies and to further explain data generated during meetings, as well as informing the development of the eMDS. Investigators set an agreement threshold at ≥ 65%, as achieving two thirds agreement across the three focus groups was considered appropriate.

3.7 Phase 3

Utilising an integrated Knowledge Translation (iKT) approach the findings from Phase 1 and 2 informed the development of an evidence-based eMDS for nursing TL handover. Integrated Knowledge Translation involves the collaboration of knowledge users and researchers to develop relevant research that benefits the user (Graham, Kothari, McCutcheon, & Integrated Knowledge Translation Research Network Project, 2018). For example, the eMDS included key components identified by TLs in Phase 2 to include in handover. Alongside the implementation of the eMDS, nursing TL handover was relocated from the desk to the bedside to fulfil the requirements of the NSQHSS – Clinical Handover. The eMDS was implemented using evidence-based strategies and was evaluated by examining the extent to which TLs used the eMDS to support their handovers, and through identifying TL perceptions of the eMDS in Phase 3.
Action Cycle steps of the KTA framework guided the implementation and evaluation process.

3.7.1 Assess barriers and facilitators to knowledge use

Translating knowledge into practice involves ensuring that healthcare professionals and consumers have access to, and are aware of, research evidence to inform health-related decision-making. Despite high quality evidence, knowledge translation in healthcare settings can be challenging (Braithwaite et al., 2014; Plamondon & Caxaj, 2018). An action step within the KTA framework involves identifying barriers and facilitators to knowledge use, prior to implementing change strategies in healthcare. Through understanding the barriers and facilitators, implementation strategies can be tailored specifically to the healthcare environment and can assist to streamline practice change.

3.7.1.1 Survey

To identify factors that would facilitate or impede TLs’ use of the eMDS, a survey was distributed to TLs to determine the barriers and facilitators to eMDS use prior to implementation. These data informed implementation strategies. Surveys are an efficient method for systematically collecting data from a broad spectrum of individuals and settings (Check & Schutt, 2012). Surveys can assist to obtain large amounts of information that can be collected quickly and provide a representative picture of attitudes and characteristics of a specific population.

To identify barriers and facilitators to eMDS use, an established survey tool based on a systematic review by Cabana and colleagues (1999) was modified.
and adapted to the clinical handover context. Cabana et al, (1999) identified seven categories of barriers to guideline adherence, which related to general knowledge, attitudes and behaviours (Cabana, Rand, Powe, Wu, Wilson, Abboud et al., 1999). Knowledge barriers included lack of familiarity and lack of awareness (e.g., guideline accessibility). Attitudes impeding guideline adherence involved lack of agreement with guidelines (e.g., applicability to patient, too rigid), lack of outcome expectancy, self-efficacy and lack of motivation. The final barrier, behaviours, consisted of external barriers such as patient, guideline and external factors.

These seven barriers were used as a template to develop a survey instrument, “Attitudes Regarding Practice Guidelines”, to examine the attitudes of healthcare professionals towards general practice guidelines as well as specific areas of interest like the Hand Hygiene Guideline (Quiros, Lin, & Larson, 2007). This template has been successfully used to identify barriers and facilitators to knowledge use in several studies (Gravel, Legare, & Graham, 2006; Larson, 2004), and was modified to identify barriers and facilitators to eMDS use amongst TLs in the handover context (Appendix 2). The tool included a 6-point Likert scale with selections from ‘strongly disagree’ to ‘strongly agree’, and consisted of three sections.

The first section contained characteristics of TLs (gender, employment position and grade, and total number of years working as an RN, a TL and in ICU). The second section contained attitudinal statements (14 items) about general ICU guidelines; and the third section included attitudinal statements (20 items), and dichotomous questions relating to the ICU handover work unit guideline. In addition, participants were asked four open-ended questions
regarding factors that would either facilitate or impede the use of 1) a structured handover tool or 2) an eMDS at handover, and to self-report how often paper or electronic handover templates were used during handover.

The tool’s domains were originally confirmed by Cabana et al. (1999), who assessed the content and construct validity of the original draft instrument. The survey tool was modified for use in the current study and was further assessed by a panel of seven ICU experts, including two PhD supervisors, a Quality and Safety Clinical Nurse Consultant, a Clinical Nurse, Clinical Nurse Teacher, Clinical Nurse Consultant and a Nurse Researcher in the ICU. The panel assessed face validity (readability, understandability, ease of response and relevance to the current purpose), and content validity (clarity, consistency and content). Relevant revisions were made until the content validity index reached more than 0.8 agreement (Fink, 2009; Polit & Beck, 2012). The survey tool was pilot tested at two different time points by 10 TLs in the ICU, and reliability percentages were calculated to examine both test-retest reliability and internal consistency (there was perfect agreement or a 1-point difference in responses at two time points in 93% of the items) of overall barriers and facilitators.

3.7.1.2 Data collection

All TLs (63) were sampled to identify barriers and facilitators to eMDS use at handover. Surveys were mailed internally to all nurses working in TL roles in the ICU. An opaque envelope was placed in each ICU area for nurses to anonymously place completed surveys.
3.7.1.3 Analysis

Descriptive statistics were calculated to provide a summary of barriers and facilitators to knowledge use relating to general ICU and the ICU handover work unit guideline, handover structure and the use of an eMDS. Because of a lack of evidence in this area there was no rationale to develop or test hypotheses. Data were presented as median (interquartile range), and frequencies (percentages) (Fink, 2009). The frequency of recurring responses to dichotomous and open-ended questions were also summarised.

3.7.2 Select, tailor and implement interventions

The selection and development of appropriate strategies to translate knowledge into practice forms the next step of the Action Cycle (select, tailor and implement interventions) within the KTA framework (Graham & Tetroe, 2010). There are numerous strategies available to aid knowledge translation in healthcare settings, however not all approaches, in isolation or collectively, are applicable to each setting (Braithwaite et al., 2014; Grimshaw, Eccles, Lavis, Hill, & Squires, 2012; Haines, Kuruvilla, & Borchert, 2004). An early systematic review (Oxman, Thomson, Davis, & Haynes, 1995) of 102 trials highlighted that a single intervention alone is associated with modest or negligible practical effect (i.e. reminders), while the incorporation of multiple strategies (i.e. training, advertising, reminders) can provide cumulative and significant impacts on practice change (Grimshaw et al., 2012; Oxman et al., 1995; Wensing, van der Weijden, & Grol, 1998). Survey findings from the previous step of the Action Cycle provided an insight into the barriers and facilitators to knowledge use in the ICU, and informed
the strategies employed to implement the nursing TL eMDS into ICU. Several strategies were selected to implement the eMDS.

First, a 30-minute small group interactive education session was carried out with TLs to improve their knowledge about handover and safety, and to generate critical thinking skills and training in eMDS use (Davis, Thomson, Oxman, & Haynes, 1995; Grimshaw et al., 2012; McWilliam, 2007). Next, a small group of champions were recruited to assist with education, to challenge the barriers and support TLs to use the eMDS (Effective Practice and Organisation of Care, 2016; Soo, Berta, & Baker, 2009). The third strategy involved distributing regular reminders to TLs to facilitate utilisation of the eMDS (Effective Practice and Organisation of Care, 2016). Reminders were placed on posters at handover locations and sent via email to provide updates about handover. Instruction guides were uploaded to computer desktops and fastened to computer monitors to further embed eMDS use. Last, ad hoc audit and feedback was performed in the first four weeks of eMDS implementation. This involved the PhD candidate attending ad hoc handovers seven days a week during day and night shift changes. TLs were given feedback about their use of the eMDS and goals were set to redirect their focus to promote change and efficient use of the handover tool (Jamtvedt, Young, Kristoffersen, O’Brien, & Oxman, 2006; Krenn et al., 2013). This was also an opportunity for the PhD candidate to gain feedback about the eMDS, to inform further modifications and to troubleshoot issues with the tool if they arose. These strategies have been successfully used in previous studies to promote knowledge translation. More details about these strategies are provided next.
3.7.2.1 Education

A variety of educational strategies exist to facilitate knowledge translation in the practice setting. Small group interactive education sessions have been shown to assist with the knowledge translation gap (Gordon, 2013; McWilliam, 2007; Rehman, Khan, & Kamran, 2012). Interactive education sessions involve delivering information to a small group of people using an interactive and participatory approach. Prior to eMDS implementation, the research team, in collaboration with nurses and medical staff from all levels in the ICU, offered their time to role play in an educational handover video to be used in TL education sessions. All TLs attended education sessions. First, TLs watched the educational video, which comprised of a handover overview, including the key requirements of the NSQHSS – Clinical Handover; the ICU handover work unit guideline; hospital handover policy, and patient safety risks associated with miscommunication during handover. Next, TLs critiqued two handover scenarios included in the educational video, and were asked questions to develop critical thinking, decision making and problem solving skills related to effective handovers (Russell, Cornello, & Wright, 2007). Finally, TLs were provided training in eMDS use in the clinical setting.

3.7.2.2 Champions

Alongside education sessions, a group of clinicians consisting of TLs and nursing management were recruited as ‘champions’ to assist with the implementation of the eMDS in ICU. An expression of interest was advertised in ICU for volunteers to assist with the eMDS implementation process. A study exploring the role of champions and knowledge translation (Soo et al., 2009)
found that champions played a key role in educating staff about initiatives, making clinicians aware of healthcare issues and advocating innovations to improve practice. They also challenged the barriers identified in healthcare settings to promote change and develop positive relationships with colleagues that assisted in promoting practice change. Champions have been labelled the driving force behind the implementation of many initiatives in healthcare settings (Ash, Stavri, Dykstra, & Fournier, 2003), with the absence of champions shown to result in poor adoption (Graham & Logan, 2004). Champions received education about the eMDS and its application in ICU, and assisted the researchers with knowledge translation strategies by providing further handover education, training and support in eMDS use, prior to and during eMDS implementation.

3.7.2.3 Reminders

An additional strategy employed to prompt clinicians to use the eMDS involved reminders (Siddiqi, Newell, & Robinson, 2005). A reminder involved providing specific information verbally, on paper, or electronically, and is designed to prompt a clinician to recall information (Grimshaw et al., 2012). Earlier studies have indicated that simple reminders were associated with positive adoption of evidence-based strategies (Balas, Austin, Mitchell, Ewigman, Bopp, & Brown, 1996; Haines et al., 2004; Hysong, Best, & Pugh, 2007). Over 20 years ago, a review of 100 trials showed that 75% of trials that used reminders had substantial improvements with prompting clinicians to use the tool (Balas et al., 1996). While more recent studies have identified reminders to have a moderate effect on guideline implementation (Arditi, Rege-Walther, Wyatt, Durieux, & Burnand, 2012; Shojania, Jennings, Mayhew, Ramsay, Eccles, &
Grimshaw, 2009), the evidence is variable and further work is required to confirm their use as an effective knowledge translation strategy (Chaudhry, Wang, Wu, Maglione, Mojica, Roth et al., 2006; Grimshaw et al., 2012). Reminders were used in ICU by positioning posters at handover locations, placing information in a communication book accessed by TLs, emailing TLs with handover updates, uploading instruction guides to desktop computers, or fastening paper reference guides to computer monitors.

3.7.2.4 Ad hoc audit and feedback

During the first four weeks of eMDS implementation the PhD candidate attended ad hoc TL handovers seven days a week, during night to day shift handover or day to night shift handover. The PhD candidate provided support to TLs using the eMDS and gave ad hoc feedback about TLs use of the tool (i.e. navigation of the tool and use of content). Ad hoc feedback provides a summary of performance during a snapshot of time (Krenn et al., 2013). Feedback is widely used in healthcare and has an extensive influence on performance (Krenn et al., 2013). Despite widespread use of feedback there is much variation with its effect on performance. A systematic review of interventions, reported in 118 study datasets, found effects varied from a 16% decrease to a 70% increase in adherence to recommended practice (Jamtvedt et al., 2006). Providing employees with feedback can be a complex, multi-dimensional process and, despite its use over the last century, there is limited evidence to inform its use in improving performance (Kluger & DeNisi, 1996). There is growing recognition that theory should play a central role in the design and evaluation of behaviour change interventions, so that we can better understand the effects of feedback on
performance (Craig, Dieppe, Macintyre, Michie, Nazareth, Petticrew et al., 2008; Ivers, Jamtvedt, Flottorp, Young, Odgaard-Jensen, French et al., 2012; Painter, Borba, Hynes, Mays, & Glanz, 2008).

Based on control theory (Carver & Scheier, 1982), Kluger and DeNisi (1996) developed the Feedback Intervention Theory (FIT) to guide feedback interventions. Although uptake of theories to guide feedback has been slow, use of the FIT is gaining momentum among researchers. The FIT is a behavioural change theory that provides a standardised framework for evaluating intervention content. The FIT is based on the assumption that behaviour is regulated by comparisons of feedback with goals or standards; and that attention is limited (Kluger & DeNisi, 1996). Using the theoretical underpinnings of the FIT, TLs were provided with ad hoc feedback about their performance in relation to their use of the tool. New goals or targets were then set and a plan to achieve those goals were discussed to promote accurate and efficient use of the eMDS. Using the interventions discussed (education, training, champions, reminders, audit and feedback) helped to facilitate and embed practice change at TL handover.

3.7.3  Monitor knowledge use

The next step of the Action Cycle, in Phase 3 of the research (implementation and evaluation), was to monitor knowledge use. Monitoring knowledge use refers to the ability of clinicians (TLs) to make full use of innovations in healthcare (Canadian Institutes of Health Research, 2016; Graham & Tetroe, 2010; Logan & Graham, 1998). During this phase an audit was carried out following the three-month implementation period to determine the extent of TL use of the eMDS during handover. Using theoretical underpinnings of the FIT
(feedback given in relation to goals or standards; feedback focused on gaps in practice; and interventions introduced to change the focus of attention leading to behaviour change), feedback was provided to TLs at education sessions regarding audit results.

3.7.3.1 Audit and feedback

A second formalised audit and feedback tool was used to assess nurses’ use of the eMDS following the three-month implementation period. Audit and feedback is used widely in healthcare to assess clinical performance and, in this case, to monitor knowledge use. This technique has been found to be among the most effective behavioural interventions for improving care quality in numerous settings, and can help reduce variability and improve overall quality of care (Jamtvedt et al., 2006).

Using the foundations of the FIT, TLs were provided with feedback about their use of the eMDS at handover during education sessions. Audit results provided a snapshot of TLs performance, including items that were frequently and infrequently discussed at handover. New targets and action plans were set to promote increased use of the tool at handover. This goal-driven concept prompts clinicians to change their behaviour in response to feedback about the divergence between their current behaviour and a behavioural goal (Krenn et al., 2013). An audit report was also posted around the ICU and staff room and was emailed to TLs to remind them about the goals of handover using an eMDS.
3.7.3.2 Data collection

A total of 49 handovers (49 nurses giving handover, 49 nurses receiving handover), representing 78% of the TL population, were observed and the extent of eMDS use was assessed over 25 days, Monday to Friday. An audit of TL clinical handovers commenced following the three-month implementation period of the eMDS. Forty-nine observed handovers resulted in 322 patient handovers (approximately seven patient handovers for each TL handover), which provided a broad representation of the current content of TL handovers. Like data collection methods used in Phase 1, strategies were used to decrease bias. These include a random number generator to randomly sample one TL handover from the three areas in the ICU, during the night to day shift and the day to night shift handover. Handovers were observed if the oncoming and outgoing nurse provided consent to participate and had not been previously observed giving a handover. If the TL conducting handover did not provide consent or had been previously observed, the next randomly selected pair were approached and studied. Prior to commencement of handover, consent was confirmed and the participant was audited. One of three auditors (PhD candidate, Clinical Research Nurse or a Quality and Safety Clinical Nurse) attended bedside handover alongside the oncoming and outgoing TL, as well as one or two floats, a Clinical Nurse Consultant and other nurses that had not been allocated a patient load. Nurses were observed once giving handover and any number of times receiving handover.

To identify the extent of eMDS use by TLs, an audit tool was developed and informed by the NSQHSS – Clinical Handover and Phase 2 findings, which determined the components to include in an eMDS for TL handover (Appendix
3. The audit tool contained three sections: 1) characteristics of TLs being audited (gender, position, number of years working as a nurse in ICU and in the TL role); 2) general handover information (ICU area; shift; handover time; handover location; frequency; source and reason interruptions occurred; and handover forms or templates used during handover); and 3) adherence to the ISBAR schema and key components identified by TLs to include in an eMDS for handover. The audit criteria were either met or not met.

The audit tool was scrutinised by an expert panel of six experienced clinicians, including two PhD supervisors, a Quality and Safety Clinical Nurse Consultant, a Clinical Nurse, Clinical Nurse Teacher and a Clinical Nurse Consultant in ICU for face validity. Next, inter-rater reliability was established (≥ 80% agreement) between three auditors prior to commencing data collection (Polit & Beck, 2012).

3.7.3.3 Analysis

Descriptive statistics (frequency, percentages, median, interquartile range) were used to express audit results. The frequency of yes/no answers in section three indicated TL use of the eMDS.

3.7.4 Evaluate outcomes

The next step of the Action Cycle of the KTA framework involved evaluating outcomes through assessing the impact of the intervention, or knowledge use of the clinician, consumer or organisation (Canadian Institutes of Health Research, 2016). In this phase the eMDS was evaluated using a survey tool to examine TL perceptions’ of using a standardised, evidence-based eMDS for handover.
3.7.4.1 Survey

Surveys are a valuable resource to measure a diverse range of healthcare properties (Aday & Cornelius, 2006). Survey findings provide insight into the development, implementation and evaluation of practices, such as TL perceptions’ of using an eMDS for handover (Aday & Cornelius, 2006). Researchers are also able to identify clinician expectations, measure satisfaction levels, and determine specific areas for improvement (Aday & Cornelius, 2006). Survey results provided an evaluation of the eMDS determined by nurses’ perceptions of its use in handover.

The ‘Clinical Handover Staff Survey’ developed by O’Connell, Macdonald and Kelly (2008) was adapted to the clinical setting to assess TL perceptions’ of the eMDS (Appendix 4). The ‘Clinical Handover Staff Survey’ was originally developed by five expert nurses based on the current literature, and is widely used in handover research (Kerr et al., 2011; Klim, Kelly, Kerr, Wood, & McCann, 2013). Perceptions, strengths and weaknesses of the eMDS were included in the survey to facilitate further modifications to the tool and implementation strategies, and to promote sustained use of the eMDS. The survey consisted of four sections: 1) characteristics of the TL (hours worked, position level and grade, age, gender, number of years working as an RN in ICU and as a TL); 2) TL perceptions of the handover process (25 items); 3) perceived strengths and limitations of the current handover process; and 4) suggestions for improvement. Team Leaders were asked to rate a series of statements on a 7-point Likert scale to assess perceptions of the eMDS in practice. The responses ranged from ‘Strongly Disagree’ to ‘Strongly Agree’, and each item was given a score from
one to seven. Nurses were also asked to respond to open-ended questions related to the perceived strengths and limitations of the eMDS, and where improvements could be made.

Although the survey tool has been previously assessed for face validity, the tool underwent further scrutiny by an expert panel of four clinicians (one PhD supervisor, a Nurse Researcher and two ICU nurses) for face and content validity (using a two-point scale, with “clear” or “not clear” and, “yes” or “no”) (Fink, 2009; Polit & Beck, 2012). Although the initial content validity index was more than 0.8 (clarity: 0.89, consistency: 0.89 and content: 1.0, Scale-Content Validity Index and Universal Agreement), questions were revised until perfect agreement was achieved (Polit & Beck, 2012). The survey tool was pilot tested at two different time points, by eight TLs in the ICU, to establish test-retest reliability (there was perfect agreement or a 1-point difference in responses at two time points in 83% of the items).

3.7.4.2 Data collection

Using a cross-sectional design, all TLs (total of 63 TLs) were sampled. Paper surveys were placed in a transparent envelope on the central ICU desk in the three ICU areas. An opaque envelope was placed beside the folder for completed surveys to be stored. Completed surveys were picked up by the PhD candidate each afternoon for three weeks. Email reminders were sent to TLs weekly for three weeks and were compiled at the end of the three-week period.
3.7.4.3 Analysis

Descriptive statistics were used to summarise the data from the post eMDS-implementation survey. Data were presented as median (interquartile range), standard deviation (mean) and frequency (percentages) (Fink, 2009). Responses to open-ended questions were summarised using content analysis and the frequency (percentages) of recurring responses were determined.

3.8 Trustworthiness, reliability and validity of research findings

A variety of qualitative and quantitative methods were used throughout this project. Research rigour, trustworthiness of qualitative findings, and the reliability and validity of quantitative findings are described.

3.8.1 Trustworthiness of qualitative research

Lincoln & Guba's (1985) framework of quality criteria is considered the ‘gold standard’ for ensuring qualitative research findings are trustworthy. The key criteria to ensure trustworthiness includes: credibility, dependability and transferability (Lincoln & Guba, 1985; Polit & Beck, 2014; Polit & Hungler, 1991). These criteria represent parallels of reliability, and validity of quantitative research.

3.8.1.1 Credibility

To ensure the research findings were credible, and not influenced by the researcher’s perceptions of handover, several strategies were employed. To avoid TL misconceptions of the study in the ICU setting, several education
sessions were carried out to inform nurses about the study, and the purpose of the research, prior to study commencement. These sessions assisted researchers to develop a rapport with participants and facilitated the extraction of rich and accurate information throughout Phase 1 and 2 (Polit & Beck, 2012).

During Phase 1, handovers were audiotaped, transcribed by an external, experienced transcriptionist, and analysed by the PhD candidate using content analysis to identify current TL handover content. To prevent potential biases influencing the data, emerging themes were supported by quotes, and detailed notes were recorded as memos by the PhD candidate. Emergent categories were scrutinised regularly throughout the inductive content analysis by senior researchers, as part of PhD supervisory meetings. Deductive content analysis was carried out by two experienced research nurses and compared to ensure reliability (inter-rater reliability ≥0.8 agreement) of coding throughout the analysis (Polit & Beck, 2012).

During Phase 2, a broad range of senior nurses (i.e. nurses with varying ages, experience and opinions) were represented in focus groups to discuss and brainstorm a range of ideas. This enabled the researchers to develop an eMDS reflective of TL needs in the ICU.

3.8.1.2 Dependability

To ensure dependability of the research findings, the processes used and decisions made during data collection and analysis were thoroughly documented (Lincoln & Guba, 1985; Polit & Beck, 2012). This ensured a systematic detailed audit trail was maintained throughout the study. During Phase 1 (audiotaped
handovers) transcripts from TL handovers were obtained and printed. The raw data were coded (coding written in margins of transcripts), categorised (theoretical notes detailing categories developed) and extracted (memos containing quotes to explain themes formulated) by two experienced researchers. During Phase 2 (focus groups using an NGT) the findings from Phase 1 (current content of TL handovers) were presented to TLs. TLs were asked to vote on items to include in an eMDS for handover. TLs were also encouraged to suggest and vote on additional components to include in the eMDS. The NGT provided a structured method to obtain objective, non-bias data. Detailed field notes containing ideas discussed and decisions made were documented throughout the sessions to verify the findings. Responses from the three focus groups were analysed separately and then compared for consistency (Gibbs, 1997), with qualitative differences quantified to develop a single data-set (Gallagher, Hares, Spencer, Bradshaw, & Webb, 1993). The detailed audit trail ensures the research findings are dependable and trustworthy.

3.8.1.3 Transferability

To date, this is the first study to describe the content of TL handover in ICU, and to devise an evidence-based eMDS for TL handover. Furthermore, the large participation rate from TLs provides a broad and rich representation of TL handovers in ICU, which may be applicable to other tertiary referral ICUs throughout Australia. These findings will increase knowledge in this area and assist other ICUs to use evidence-based handover tools to improve communication of critical patient information at handover (Elo & Kyngas, 2008;
Graneheim & Lundman, 2004; Lincoln & Guba, 1985; Polit & Beck, 2012). Use of these findings in future research will demonstrate transferability.

3.8.2 Reliability and validity of quantitative research findings

Reliability and validity are two important aspects that indicate whether quantitative findings are accurate, truthful and believable. Techniques used to ensure reliability and validity throughout the research are discussed below.

3.8.2.1 Reliability

Quantitative research is considered reliable if researchers can show that repeated measurements yield the same results (Schmidt & Brown, 2012). In Phase 3 (implementation and evaluation), two surveys were utilised to assess barriers and facilitators to nurses’ use of the eMDS during handover (pre-eMDS implementation) and nurses’ perceptions of using an eMDS during handover (post-eMDS implementation). These surveys were previously developed, trialed and tested for reliability and validity by expert researchers, and were considered reliable tools to use in this project. An audit tool was also developed based on the findings from Phases 1 and 2 and the NSQHSS – Clinical Handover, to assess TL use of the eMDS post implementation.

The survey tools were modified to the ICU context and all three instruments underwent further scrutiny to optimise reliability. To determine if the survey tools produced the same results on repeated occasions, eight to ten TLs were asked to complete the surveys on two occasions to demonstrate test-retest reliability. Prior to auditing, inter-rater reliability was established between three nurses
observing TL handovers of the same patients on multiple occasions until interrater reliability was demonstrated at ≥ 80%.

3.8.2.2 Validity

Validity refers to the degree an instrument measures what it is supposed to measure. To ensure the surveys and audit tool in Phase 3 were valid instruments that captured and represented the attitudes and traits of the research, including the aims of the project, a panel of seven (two PhD supervisors, a Quality and Safety Clinical Nurse Consultant, a Clinical Nurse, Nurse Researcher, Clinical Nurse Teacher and a Clinical Nurse Consultant) tested items within each tool for face and content validity, and by determining the content validity index which informed relevant modifications to the tools.

3.9 Ethical consideration

When humans are used as study participants, researchers must ensure that the rights of the participants are honoured. Human rights violations in the past have led to the development of a code of ethics (e.g. Declaration of Helsinki) that ensures the rights of individuals participating in research studies are protected (Polit & Beck, 2012). To ensure this research study met ethical standards, approval was sought from TPCH Human Research Ethics Committee (HREC) (HREC/10QPCH/5) and Griffith University (GU) HREC (NRS/09/13/HREC) prior to commencement. The research was conducted in accordance with the approved protocol (Appendix 5). Furthermore, several fundamental ethical principles were considered when conducting this research study. These include
respect for autonomy, beneficence and justice (Holloway & Wheeler, 2010; Polit & Beck, 2012).

3.9.1 Autonomy

Autonomy involves respecting the decision-making capability of autonomous persons (Polit & Beck, 2012). Autonomy was demonstrated in this study through ensuring potential participants were fully informed (i.e. risks and benefits explained) about the study during morning meetings and nursing education sessions. All potential participants were given participant information sheets and consent forms related to the three phases of the study, which were sent via internal mail to all nursing staff working in TL roles in the ICU. Participants were volunteers and were required to provide written consent prior to study commencement. Verbal consent was also confirmed at the time of participation. Nurses were informed that they could withdraw from the study at any time, which would not affect their employment or working relationships. While the PhD candidate was an employee of the ICU, the PhD candidate was not the TL line manager and did not coerce the TL to agree to participate. As patients were not the focus of this research, they were not required to provide consent.

3.9.2 Beneficence

Beneficence refers to providing benefits and balancing benefits against risks and costs. Participants were not subjected to any risks of harm or discomfort by being involved in this study (non-maleficence) (Polit & Beck, 2012). Although there were no foreseeable risks by participating in the study, the PhD candidate
or Clinical Research Nurse could intervene and follow the correct processes if they perceived participant safety to be compromised. Issues may include the participant disclosing a personal/work related issue during focus groups, or experiencing high levels of stress or anxiety using the eMDS but none occurred. If the research nurse had identified these problems to be serious, they would have alerted the Chief Investigator (PhD candidate), referred the employee to the relevant support service (e.g. Queensland Health Employee Assistance Program to receive free, confidential counselling), and submitted an adverse or serious adverse event report to HREC within 24 hours. Data collection would have ceased until the HREC acknowledged there were no risks associated with resuming the study. Relevant support services were available to participants if required. However, this never was required. Although participants did not receive any incentives, such as monetary gifts to participate, the findings assisted with the development of an eMDS for TL handover which could potentially lead to reduced adverse patient events associated with poor communication at handover in the future (Polit & Beck, 2012).

3.9.3 Justice

This principle ensures participants receive fair treatment and that their involvement remains private. All participants and potential participants were treated fairly (Polit & Beck, 2012). Researchers demonstrated respect for the beliefs, habits and lifestyles of participants from different backgrounds and cultures (Polit & Beck, 2012). Participants were provided with contact details for the Chief Investigator to clarify study related questions and the HREC for questions related to the ethical conduct of the study. All data remains confidential,
de-identified and will not be used to exploit participants. Participants were informed that all conversations during the focus groups would remain confidential. All electronic data were stored in password-protected files and hard copies were stored in a securely locked cabinet. Documents will be stored for a minimum of five years, in line with the National Health and Medical Research Council guidelines (Australian Government, 2007).

3.10 Summary

In summary, a three-phase prospective interventional study was carried out. In phase 1, the content of information handed over during ICU nursing TL handover (audiotaped handovers) was determined. In Phase 2 the key components to include in an eMDS for TL handover in ICU (focus groups) were identified. Phase 3 involved the implementation (survey to assess barriers to TL uptake of the eMDS, implementation strategies to promote uptake of the eMDS) and evaluation (observational audit to determine TLs’ use of an eMDS, survey to evaluate TLs’ perceptions of eMDS use) of an eMDS for TL nursing shift-to-shift handover. Phase 1 data were analysed using inductive and deductive content analysis. Phase 2 data were analysed using an NGT, and descriptive statistics were employed to evaluate Phase 3 data. Trustworthiness of qualitative research findings, reliability and validity of quantitative research findings and ethical considerations employed to conduct the research were also discussed.
Chapter 4: Results

As per the Griffith University guidelines, this chapter follows the following format: 1) chapter introduction; 2) brief comment about the paper; 3) statement of contribution of co-authored paper (including co-author signatures); 3) paper (word format including references); and 3) chapter summary.
4.1 Introduction

Miscommunication during handover has been rated as one of top five preventable causes of patient adverse events. Despite a wealth of research, and the development and integration of handover resources into healthcare settings, there is limited knowledge regarding ICU handover practices and a scarcity of resources available to guide handover in the critical care setting. This gap in knowledge confirmed the need to conduct further research in this area. A three-phase prospective interventional study was carried out to examine ICU TL nursing shift-to-shift handover. The research was underpinned by a conceptual framework (KTA) which provided a systematic structure to the phases of the study. The aims of the research were to determine the content of information handed over during ICU nursing TL handover (Phase 1, publications 1 and 5), identify the key components to include in an MDS (Phase 2, publication 2) and to implement and evaluate an eMDS for nursing TL handover (Phase 3, publications 3,4 and 5). Specific research questions that guided the study included:

1. What is the current content of ICU TL handover?

2. What data do nurses think should be handed over during TL handover?

3. To what extent do TLs use the eMDS to support handover?

4. Do the characteristics of interruptions during handover change following eMDS implementation?

5. What are TLs' perceptions of an eMDS?
In this chapter, results from Phases 1, 2 and 3 will be described in five co-authored papers that have been published in peer-reviewed journals. The findings from each paper informed the next phase of the study.
4.2 Phase 1, publication 1

Prior to this study, TL handover in ICU had not been examined. To identify the current content of TL handover, TL handovers were audiotaped, transcribed and analysed. The first paper reports on and discusses Phase 1 findings, establishing a baseline of content discussed during TL nurse handover in the ICU. Furthermore, the findings revealed where handover improvements were needed to align with the NSQHSS – Clinical Handover, and informed Phase 2 of the study.

Statement of contribution to co-authored published paper

The first co-authored paper in this chapter was accepted for publication with the *International Journal of Nursing Studies*. The details of the co-authored paper, including all authors, are:

My contribution to the paper involved:

- Critical review of the literature
- Conception and design of the study
- Participant enrolment
- Data collection
- Data cleaning and analysis
- Data interpretation
- Writing of the manuscript
- Revision of the manuscript for important intellectual content
- Approval of the final version

I completed the research and writing of the paper with methodological and editorial advice from my PhD supervisors Professor Wendy Chaboyer and Professor Leanne Aitken and work colleagues Amanda Corley and Professor John Fraser.
19/07/2018

Date

Student: Amy Janine Spooner

20/07/2018

Date

Co-author of the paper and supervisor: Professor Wendy Chaboyer

19/07/2018

Date

Co-author of the paper and supervisor: Professor Leanne Aitken
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Nursing team leader handover in the intensive care unit contains diverse information and lacks structure: An observational study

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ABSTRACT

Background

Despite a proliferation of evidence and the development of standardised tools to improve communication at handover, evidence to guide the handover of critical patient information between nursing team leaders in the intensive care unit is limited.

Objective

The study aim was to determine the content of information handed over during intensive care nursing team leader shift-to-shift handover.

Design

A prospective observational study.

Setting

A 21-bed medical/surgical adult intensive care unit specialising in cardiothoracic surgery at a tertiary referral hospital in Queensland, Australia.

Participants

Senior nurses (Grade 5 and 6 Registered nurses) working in team leader roles, employed in the intensive care unit were sampled.
Method

After obtaining consent from nursing staff, team leader handovers were audiotaped over 20 days. Audio recordings were transcribed and analysed using deductive and inductive content analysis. The frequency of content discussed at handover that fell within the *a priori* categories of the ISBAR schema (Identify-Situation-Background-Assessment-Recommendation) was calculated.

Results

Forty nursing team leader handovers were recorded resulting in 277 patient handovers and a median of 7 (IQR 2) patients discussed at each handover. The majority of nurses discussed the *Identity* (99%), *Situation* (96%) and *Background* (88%) of the patient, however *Assessment* (69%) content was varied and patient *Recommendations* (60%) were discussed less frequently. A diverse range of additional information was discussed that did not fit into the ISBAR schema.

Conclusions

Despite universal acknowledgement of the importance of nursing team leader handover, there are no previous studies assessing its content. Study findings indicate that nursing team leader handovers contain diverse and inconsistent content, which could lead to inadequate handovers that compromise patient safety. Further work is required to develop structured handover processes for nursing team leader handovers.
Key words:

Patient handoff, critical care, quality improvement, patient safety, communication
BACKGROUND

Clinical handover is “the transfer of information, responsibility and accountability between individuals and teams” (British Medical Association, 2006) and is an inherent part of patient care. Handovers predominantly occur at shift changes, when clinicians take breaks, when patients transfer between wards or hospitals and on discharge. In recent years, poor clinical handover practice has been identified as a major contributing factor to patient harm, with 80% of serious errors in healthcare attributed to communication errors between care givers during the transfer of patients and approximately one in five patients experiencing an adverse event (Australian Commission on Safety and Quality in Health Care, 2011).

Clinical handover is listed as one of five priority areas for patient safety improvement worldwide (World Health Organization., 2007). Over the last decade the Australian Commission on Safety and Quality in Health Care has taken an active role in piloting research projects and developing handover resources to improve communication practices in healthcare facilities nationally (Australian Commission on Safety and Quality in Health Care, 2011). More recently, the Australian Commission on Safety and Quality in Health Care introduced the National Safety and Quality Health Service Standard – Clinical Handover, Standard 6, whereby all health care facilities are required to have structured handover processes in place (policies and procedures, work unit guidelines, minimum datasets) to meet accreditation standards.

National and international strategies to improve clinical handover practices and reduce adverse events associated with inconsistent communication has led
to major changes in handover processes (Australian Commission on Safety and Quality in Health Care, 2010b; Institute of Medicine (US) Committee in Optimizing Graduate Medical Trainee (Resident) Hours and Work Schedule to improve patient safety, 2009; Jorm et al., 2009). One recent initiative is the movement of the handover location from offices and desk spaces to the bedside, facilitating face-to-face interactions among both clinicians and patients as opposed to written, recorded or phone handover. Although clinicians have reported concerns regarding patient confidentiality (Anderson et al., 2015b; Mardis et al., 2016) and frequent interruptions with bedside handovers, there is a general belief that bedside handover is beneficial to both patients and staff. Patient benefits include increased patient and family involvement with clinicians during handover and reports of higher satisfaction between patients and families with communication during handover (Anderson et al., 2015b; Mardis et al., 2016). Staff benefits include enhanced prioritisation of patient-centered care (Anderson et al., 2015b; Chaboyer, Johnson, Hardy, Gehrke, & Panuwatwanich, 2010a); improvements with completion of nursing care tasks and documentation (Kerr et al., 2013); decreased overtime (Anderson et al., 2015b) and increased safety, efficiency and teamwork (Chaboyer et al., 2009).

Alongside the implementation of bedside handover, the need for structured handover has been identified. Clinicians find handover challenging if there is no structure to follow as they are forced to decide what information to include or hold back and how the information should be conveyed (Holly, Hengesbach, Traub, & Hoffmann, 2013). Consequently, unstructured handovers have been reported to contain too much or not enough information, irrelevant details, repetitive information and content that varies between clinicians (Benson, 2006; O’Connell,
Macdonald, & Kelly, 2008). In the last decade numerous handover tools have been implemented to improve communication at handover (Australian Commision on Safety and Quality in Health Care, 2010b; Craig, Moxey, Young, Spenceley, & Davidson, 2012; Joy, Elliott, Hardy, Sullivan, Backer, & Kane, 2011; Kaufmnan, Twite, Barrett, Peyton, Koehler, Rannie et al., 2013; Zavalkoff, Razack, Lavoie, & Dancea, 2011). Introducing a structured handover process, alongside bedside handover has been linked to increased confidence among clinicians (Chu, Reid, Schulz, Burden, Mancini, Ambardekar et al., 2009), improved communication (Craig et al., 2012), decreased medical and technical errors and reduced omissions of critical information (Joy et al., 2011).

While there are a multitude of handover tools available for healthcare areas to adopt, authors commonly acknowledge a single tool may not suit all areas. Communication tools need to contain flexible frameworks that can be modified or used in conjunction with other tools to ensure handover content is relevant to the clinical context (Alem, Joseph, Kethers, Steele, & Wilkinson, 2008; Anderson et al., 2015b). Furthermore, clinicians need to be engaged in the development of resources to meet user needs at handover (Alem et al., 2008; Miller, Scheinkestel, Limpus, Joseph, Karnik, & Venkatesh, 2009b). Although various tools have been implemented in ward areas (low acuity patients), tools specific to the intensive care unit (high acuity patients) are limited.

The intensive care unit is an event-driven, time-pressured environment prone to continuous distractions. Patients are critically ill and require timely care at a moment’s notice (Smith, Pope, Goodwin, & Mort, 2008). The complex and multidisciplinary nature of the intensive care environment renders it susceptible to medical errors. Handovers occur frequently in the intensive care unit between
bedside nurses, team leaders and Nurse Unit Managers. While there is published research related to topics such as intensive care bedside nursing handover (Spooner et al., 2013), handover between theatre and intensive care (Catchpole et al., 2007; Joy et al., 2011; Kaufmnan et al., 2013; Segall, Bonifacio, Schroeder, Barbeito, Rogers, Thornlow et al., 2012), emergency to intensive care (McFetridge, Gillespie, Goode, & Melby, 2007), multidisciplinary handover (Miller et al., 2009b), end of life care (Ganz, Endacott, Chaboyer, Benbinishty, Ben Nun, Ryan et al., 2015) and interruptions during handover in the intensive care unit (Gupta, Sharda, Dong, Sharda, Asamoah, & Pickering, 2013; Spooner et al., 2015), little is known about intensive care team leader handover. As their title suggests, team leaders coordinate and manage care for multiple critically ill patients, supervise bedside nurses and liaise with all members of the multidisciplinary team. Maintaining patient continuity and safety requires team leader shift-to-shift handovers to be detailed, structured and informative. The study aim was to determine the content of information handed over during intensive care nursing team leader shift-to-shift handover. These data will lay the foundation for researchers to determine where gaps in practice exist in relation to the National Safety and Quality Health Service Standards, so that handover resources can be developed and tailored to the nursing team leader handover.

**METHODS**

Ethical approval was obtained by the Institutional and University Human Research and Ethics Committee.
Setting

A prospective observational study was conducted in a 21-bed (government funded) medical/surgical adult intensive care unit, specialising in cardiothoracic surgery at a tertiary referral hospital, in Queensland, Australia. There are 180 registered nurses employed in the intensive care unit including 63 senior registered nurses (Grade 5 and 6) working in team leader roles. Nursing levels are part of the industrial award and range from grade 1 (Assistant in nursing) to 12 (Executive director of nursing) and in the intensive care setting nurses are employed as grade 5 to 7. Grade 5 nurses (Registered nurses) predominantly carry out bedside patient care and once they have successfully completed a team leader educational package, they can work as team leaders, coordinating care of up to nine patients in the intensive care. Grade 6 nurses (Clinical Nurses) are senior nurses that carry out bedside care, work in team leader roles and mentor grade 5 nurses. All team leaders have at least three years intensive care experience and a postgraduate qualification in critical care. Grade 7 nurses (Clinical Nurse Consultant, Nurse Unit Manager, Nurse Educator) are senior nurses that coordinate the clinical and managerial operation of the whole unit. The intensive care unit consists of three areas (ICU 1 - cardiac surgical, ICU 2/3 - general), each area containing up to nine beds coordinated by one team leader. Team leaders predominantly work 12-hour shifts (0700-1930 or 1900-0730) with handover conducted during the last 30 minutes of the shift. Handovers occur at the nurses’ station with a maximum of nine patients discussed by each team leader. Prior to commencing this study, team leaders could choose from five different paper handover templates to conduct handover within the three
intensive care areas. There was no standardised tool utilised, with various tools used in a single handover, depending on team leader preference.

**Participants**

Senior nurses (Grade 5 and 6 Registered nurses) working in team leader roles, employed in the intensive care unit were sampled. All team leaders in the intensive care received participant information sheets and consent forms via internal mail. Potential participants were informed of the study at staff meetings and written consent was obtained prior to study commencement.

**Data collection**

Forty team leader handovers were audiotaped which provided a broad representation of the current content of team leader handovers. To reduce the chance of bias, a random number generator was used to sample in a random fashion one team leader handover from the three areas within intensive care during the night to day shift and the day to night shift handover between Monday and Friday. Handovers were audiotaped if the oncoming and outgoing nurse provided consent to participate and had not been previously recorded handing over. If the team leader conducting handover did not provide consent or had been audiotaped previously, the next randomly selected pair were approached and recorded. Prior to commencement of handover, consent was confirmed with the participants and the audio recorder was started.
Nurses were recorded once giving handover and any number of times receiving handover. The audio recorder was positioned on the desk at the nurses’ workstation where handover occurred. Handover consisted of the outgoing nurse giving handover as well as questions and answers between the oncoming and outgoing nurse. The recorder was stopped once the outgoing nurse left the desk at the nurses’ workstation. Nurses participating in this study had previously been exposed to audiotaped handovers during a study examining bedside handover in the intensive care and during hospital-wide auditing of clinical handover. Nurses’ previous exposure to audiotaping assisted in reducing the chance of participants changing their usual practice during audiotaped team leader handovers. A case report form was used to collect demographic data during this phase. Demographic and other data included nursing grade, hours worked per fortnight, number of patients handed over, length of time taken to perform handover and handover shift.

**Data analysis**

An experienced transcriptionist transcribed the audio recordings. The transcripts were checked for accuracy by a researcher (AS). Deductive and inductive content analysis were used to examine the data. Inter-rater reliability (98%) between two research nurses (AS and BP) performing the content analysis was tested on 10 transcripts to ensure consistency and reliability.

Deductive content analysis (Elo and Kyngas, 2008, Vaismoradi et al., 2013) was used to categorise data from the transcripts according to the ISBAR schema (Identify-Situation-Background-Assessment-Recommendation), a tool originally
developed by the United States military and adapted for healthcare by Kaiser and Permanente (Elo & Kyngas, 2008; Haig et al., 2006; Vaismoradi et al., 2013). For the ‘Assessment’ category within the ISBAR schema, the frequently used body systems approach, (central nervous system, respiratory system, cardiovascular system, renal system, gastrointestinal system, skin system and social network) was used to further categorise the data (Elo & Kyngas, 2008; Haig et al., 2006).

Data that did not fit into these a priori ISBAR categories were analysed inductively and were used to create additional categories based on the principles of inductive analysis (Elo & Kyngas, 2008; Vaismoradi et al., 2013). An iterative process was adopted, whereby the researchers moved between the raw data to the emerging findings (categories), back to the raw data. Data were read and re-read with similar ideas grouped together and a descriptive category label given to each. Emergent labels were scrutinized by senior researchers (WC, LA). These labels formulated a general description and new knowledge about the content of information discussed at handover.

A quasi-quantitative approach was also used to identify the frequency of a priori categories (ISBAR), subcategories (body systems approach) and inductive categories that were discussed during handover. These results revealed which data were frequently and infrequently handed over by team leaders during handover.
RESULTS

Forty nursing team leader handovers were recorded (40 nurses giving handover, 40 nurses receiving handover) resulting in 277 patient handovers with a median of seven patients (IQR 2) discussed at each handover. Half of the team leaders giving handover were grade 6 Clinical Nurses and the remaining nurses were grade 5 Registered nurses working in team leader roles. Approximately half of the team leaders studied were full time employees (Table 4.2.1). All handovers were conducted at the nurses’ workstation and were evenly spread between the three areas of the intensive care unit. Sixty percent (n=24) of handovers were recorded from the night to day (0700-0730) shift. The mean handover time was 22 (± 7) minutes or 3 (± 1) minutes per patient (Table 4.2.1).

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
<th>Median SD</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade of Registered Nurse</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade of Registered Nurses giving handover</td>
<td>Grade 5</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Grade of Registered Nurses receiving handover</td>
<td>Grade 6</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Registered nurses giving handover</td>
<td>Full time</td>
<td>22</td>
<td>55</td>
</tr>
<tr>
<td>Employment status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Registered nurses receiving handover</td>
<td>Part time</td>
<td>18</td>
<td>45</td>
</tr>
<tr>
<td>Handover shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night – day shift</td>
<td>24</td>
<td></td>
<td>60</td>
</tr>
<tr>
<td>Day – night shift</td>
<td>16</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Handover time</td>
<td>Total (minutes)</td>
<td>896</td>
<td>22 ± 7</td>
</tr>
<tr>
<td>Handover time</td>
<td>minutes/patient (n=277)</td>
<td>3 ± 1</td>
<td></td>
</tr>
</tbody>
</table>
Deductive analysis

Overall, the majority of nursing team leaders referred to the patient’s *Identity* (99%), the *Situation* (96%) and the patient’s *Background* (88%) during handover. Within the *Assessment* category of the ISBAR schema, the body systems approach (central nervous system, respiratory system, cardiovascular system, renal system, gastrointestinal system, skin system and social network) was used to further categorise the content (Table 4.2.2). Overall, 100% of nursing team leaders referred to the *Assessment* category. The body systems frequently discussed at handover included central nervous system (83%), respiratory system (96%), cardiovascular system (95%) and the renal system (85%), while other body systems were mentioned less frequently. A large amount of diverse information was discussed within each body system with little consistency between handovers. The final category *Recommendations* (60%) included consults/referrals to specialists, all those activities that required follow up, were intended to guide team members in the plan of care and was the least frequent category referred to at handover. Overall, 51% of 277 handovers contained at least one concept within each category of the ISBAR schema.
Table 4.2.2 Deductive content analysis

<table>
<thead>
<tr>
<th>ISBAR category/ sub-categories</th>
<th>Frequency</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify</td>
<td>276 (99)</td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>251 (91)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>193 (70)</td>
<td></td>
</tr>
<tr>
<td>Days in ICU</td>
<td>195 (70)</td>
<td></td>
</tr>
<tr>
<td>Bed number</td>
<td>242 (87)</td>
<td></td>
</tr>
<tr>
<td>Admitting consultant/team</td>
<td>143 (52)</td>
<td></td>
</tr>
<tr>
<td>Situation</td>
<td>266 (96)</td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>221 (80)</td>
<td></td>
</tr>
<tr>
<td>Surgical procedure</td>
<td>188 (71)</td>
<td></td>
</tr>
<tr>
<td>Acute Resuscitation Plan</td>
<td>18 (7)</td>
<td></td>
</tr>
<tr>
<td>Discharge status</td>
<td>68 (25)</td>
<td></td>
</tr>
<tr>
<td>Background</td>
<td>242 (88)</td>
<td></td>
</tr>
<tr>
<td>Medical history</td>
<td>182 (68)</td>
<td></td>
</tr>
<tr>
<td>Surgical history</td>
<td>83 (30)</td>
<td></td>
</tr>
<tr>
<td>Significant event/s</td>
<td>168 (61)</td>
<td></td>
</tr>
<tr>
<td>Management for significant event/s</td>
<td>161 (58)</td>
<td></td>
</tr>
<tr>
<td>Assessment</td>
<td>277 (100)</td>
<td></td>
</tr>
<tr>
<td>Central nervous system</td>
<td>231 (83)</td>
<td></td>
</tr>
<tr>
<td>Respiratory system</td>
<td>265 (96)</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular system</td>
<td>263 (95)</td>
<td></td>
</tr>
<tr>
<td>Gastrointestinal Tract</td>
<td>187 (68)</td>
<td></td>
</tr>
<tr>
<td>Renal System</td>
<td>236 (85)</td>
<td></td>
</tr>
<tr>
<td>Skin system</td>
<td>84 (30)</td>
<td></td>
</tr>
<tr>
<td>Social network</td>
<td>61 (22)</td>
<td></td>
</tr>
<tr>
<td>Recommendations</td>
<td>165 (60)</td>
<td></td>
</tr>
<tr>
<td>Consults/referrals to specialists</td>
<td>51 (18)</td>
<td></td>
</tr>
<tr>
<td>Patient plan for next shift/s (determined by daily clinical ward round)</td>
<td>42 (15)</td>
<td></td>
</tr>
<tr>
<td>Items Team Leader needs to follow up for next shift</td>
<td>112 (47)</td>
<td></td>
</tr>
</tbody>
</table>

*a*Reflects the results of a variety of blood, diagnostic and other tests pertaining to that body system.

*b*Reflects medications received pertaining to that body system.
Inductive analysis

Additional information that did not fit into the ISBAR schema was categorised inductively. The main categories generated were: unit specific information such as unit flow and management (admissions to the intensive care unit, bed movements, staff skill mix, theatre cases) and unit administrative tasks (dangerous drug orders, equipment issues, patient menus/orders completed); and patient specific information which included alerts (allergies, falls risk, infectious status, site of infection, precautions, PRIME clinical incident reporting system, patient consent to follow up, patient on a research study), and additional updates (antibiotics, end of life plan, mobility, patient behavior, patient weight, scheduled investigations) (Table 4.2.3). Within these categories there was much variation in the information discussed and little consistency of content mentioned during handover.
Table 4.2.3 *Inductive content analysis*

<table>
<thead>
<tr>
<th>Category/ sub-categories</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UNIT SPECIFIC INFORMATION</strong></td>
<td></td>
</tr>
<tr>
<td>Admissions to ICU</td>
<td>15 (5)</td>
</tr>
<tr>
<td>Bed movements</td>
<td>12 (4)</td>
</tr>
<tr>
<td>Staffing/skill mix</td>
<td>7 (3)</td>
</tr>
<tr>
<td>Theatre cases</td>
<td>8 (3)</td>
</tr>
<tr>
<td><strong>Unit administrative tasks</strong></td>
<td></td>
</tr>
<tr>
<td>Dangerous drug orders</td>
<td>4 (1.4)</td>
</tr>
<tr>
<td>Equipment issues</td>
<td>2 (0.7)</td>
</tr>
<tr>
<td>Patient menus/orders completed</td>
<td>3 (11)</td>
</tr>
<tr>
<td><strong>PATIENT SPECIFIC INFORMATION</strong></td>
<td></td>
</tr>
<tr>
<td>Allergies</td>
<td>24 (9)</td>
</tr>
<tr>
<td>Falls risk</td>
<td>2 (0.7)</td>
</tr>
<tr>
<td>Infectious status</td>
<td>44 (16)</td>
</tr>
<tr>
<td>Site of infection</td>
<td>25 (14)</td>
</tr>
<tr>
<td>Precautions</td>
<td>3 (2)</td>
</tr>
<tr>
<td>PRIME reports</td>
<td>2 (0.7)</td>
</tr>
<tr>
<td><strong>Additional patient updates</strong></td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td>44 (17)</td>
</tr>
<tr>
<td>End of life care</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Mobility</td>
<td>48 (17)</td>
</tr>
<tr>
<td>Patient behaviour</td>
<td>2 (0.7)</td>
</tr>
<tr>
<td>Patient weight</td>
<td>3 (1)</td>
</tr>
<tr>
<td>Scheduled investigations</td>
<td>79 (29)</td>
</tr>
<tr>
<td>Patient consent to follow up</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td>Patient on a research study</td>
<td>3 (1)</td>
</tr>
</tbody>
</table>

**DISCUSSION**

This study describes the content of nursing team leader handovers across a large intensive care unit. Although team leaders nearly always communicated information relating to some aspects (*Identify, Situation, Background*) of the ISBAR schema during handovers, *Assessment and Recommendations* were not consistently addressed in handovers and half of all handovers addressed one concept within all five categories of the ISBAR schema. Furthermore, handovers
contained a diverse range of additional information that did not relate to the ISBAR schema or the body systems framework suggesting that the ISBAR schema does not capture all the information necessary to conduct an informative nursing team leader handover.

The ISBAR schema was originally introduced into healthcare areas as a framework to assist clinicians with transferring the most crucial patient information at handover. Findings from this study suggest that critical information within Situation (i.e., Acute Resuscitation Plan) and patient Recommendations (i.e., patient plan – determined at daily clinical ward round, items team leaders need to follow up for next shift e.g., blood results, medication orders) was infrequently discussed at handover and intensive care handovers contained diverse patient information in relation to the Assessment (body systems) of the patient.

Minimal information regarding Recommendations was consistent with Ilan et al’s (2012) observational study audiotaping intensive care physician handovers with Recommendations absent in 60% of handovers (Ilan, LeBaron, Christianson, Heyland, Day, & Cohen, 2012). Similarly, an observational study that trialled three information handover tools showed minimal change with reporting the patient management plan (Recommendations) between medical staff in a general ward and emergency department (Alem et al., 2008). The inclusion of Recommendations is crucial to ensuring clinicians are clear about the plan and direction of patient care, discharge status, organised procedures etc. The plan of care at this study site is established during the daily clinical ward round between the junior registrar, senior registrar, intensive care unit consultant, the multidisciplinary team, bedside and team leader nurses. The plan of care is documented in the medical progress notes on the computer information system.
The absence of content relating to future plans for patient management has the potential to lead to errors by the incoming clinician thereby compromising patient care. Furthermore, handovers containing limited/no information regarding Acute Resuscitation Plans has been identified in other studies (Kowitlawakul, Leong, Lua, Aroos, Wong, Koh et al., 2015; Spooner et al., 2013). An Acute Resuscitation Plan is a plan/alert to document decisions about resuscitation and end-of-life clinical treatment and care (South Australia Health, 2016). It is imperative that this information is included in handover to ensure patients receive appropriate care, in line with their wishes (Cotler, 2000; South Australia Health, 2016). Further work is required to understand why these crucial handover items are consistently omitted from handovers so that strategies can be implemented to improve the inclusion of Recommendations and Acute Resuscitation Plans during handover.

There is strong evidence to suggest that the absence of critical patient information and a lack of standardised and appropriate information communicated at handover can lead to adverse patient events (Aldrich, Duggan, Lank, Nair, & Hill, 2009; Greenberg, Regenbogen, Studdert, Lipsitz, Rogers, Zinner et al., 2007; Pronovost et al., 2006). International (World Health Organisation) and national agencies (ACSQHC) have endorsed standardised handover frameworks such as the ISBAR schema to improve communication practices in an attempt to reduce adverse patient events associated with poor handover practices. Standardised frameworks provide a formula to communicate patient information with colleagues, promoting a shared understanding of patients (Manser, 2011). These frameworks have been shown to improve the effectiveness of communication transfer at handover in clinical and non-clinical
situations, especially when staff are under time constraints (Aldrich et al., 2009). Utilising a standardised framework like ISBAR in the intensive care unit could assist nursing team leaders to deliver handovers containing the most relevant and critical patient information.

This study reveals several additional concepts discussed during nursing team leader handovers that are not related to the ISBAR schema. Although not part of the ISBAR schema, additional information may provide essential patient information relevant to the nursing team leader role. For example staffing/skill mix, which refers to the level of skill, training and experience of nurses caring for patients in the intensive care unit was mentioned in some team leader handovers (Elliott, Aitken, & Chaboyer, 2012). This information enables the team leader to distinguish whether skills of individual nurses are aligned with patient acuity and alerts the team leader to nurses that may require extra support to ensure the delivery of safe, quality care to patients (Elliott et al., 2012). Other concepts discussed at handover included infectious status, site of infection and antibiotics. This knowledge provides team leaders with information relating to specific infections along with the precautions (e.g., personal protective equipment) staff should adhere to when caring for these patients. These findings indicate that handover tools such as the ISBAR schema may not adequately provide handover content required by nursing team leaders in the intensive care unit.

While the introduction of standardised handover tools may benefit handover, clinicians need to be cautious when implementing these tools into their clinical areas. Healthcare areas vary widely in size, location, specialty area and workforce and have different needs in terms of clinical handover. Standardisation must incorporate flexibility and address the needs of patients and the clinicians
in the clinical context. In a recent study minimum datasets (flexible, standardised handover tools) were trialled in six clinical areas (general medicine, general surgical and emergency) in a large tertiary referral hospital in Australia (Yee, Wong, & Turner, 2009). Nurses and medical officers used a minimum dataset containing a modified ISBAR schema (ISOBAR) and additional items specific to each clinical area to handover patient information. Implementation of the minimum dataset showed improvement in communication practices at handover (Jorm et al., 2009). Recent studies suggest that a minimum dataset containing the ISBAR schema along with additional information specific to the clinical context would provide a flexible framework that is likely to meet the needs of team leaders in intensive care (Australian Commission on Safety and Quality in Health Care., 2013; Jorm et al., 2009; Manser, 2011).

Since 2010, all Australian health care facilities are required to have processes in place to fulfil the National Safety and Quality Health Service Standard 6 – Clinical Handover to meet accreditation standards (Australian Commission on Safety and Quality in Health Care, 2010a). Using audiotaped handovers, this study reveals that a number of key criteria (e.g., using a standardised structured handover process, referring to three patient identifiers, carrying out bedside handover and including patients and care givers in handover) within National Safety and Quality Health Service Standard 6 are not met during nursing team leader handovers. These include variability in the content discussed, suggesting inadequate use of a structured process to communicate critical patient information at nursing team leader handover; not all patient identifiers were mentioned during handover (e.g., patient identification number) indicating that team leaders did not carry out bedside handover and the
patient was not adequately identified; and there was no information to indicate that patients or their family were involved in handover. Although patient and family involvement in handover is a requirement of National Safety and Quality Health Service Standard 6 and there is current research to suggest patients and family value being included in bedside handovers in the ward context (Tobiano et al., 2013), there is limited research relating to patient and family involvement during nursing handovers in the adult intensive care unit. These results suggest that further work is urgently needed to improve communication at nursing team leader handovers to ensure they meet the safety requirements of National Safety and Quality Health Service Standard 6.

**Recommendations**

In the last decade there has been global initiatives to implement structured handover processes to improve communication during handover and reduce adverse events associated with inconsistent communication at handover. As this study highlights, handover tools alone (i.e., ISBAR) may not be adequate to fulfil the handover needs of the intensive care clinician and additional information may need to be incorporated into handovers. Furthermore, consistent omissions of critical patient information highlight the need to identify barriers and facilitators relating to the inclusion of critical patient information at handover so that targeted strategies can be implemented to improve the transfer of this information at handover. The benefits of using other kinds of handovers (e.g., interdisciplinary) in the intensive care unit should be examined.
Limitations

Although this study was conducted in one intensive care unit and the sample may seem small (40), 277 patient handovers provided a large volume of data to enable a comprehensive snapshot of nursing team leader shift-to-shift handover content in intensive care. The investigators chose to study handovers between Monday and Friday, as the intensive care was busiest during this time. It is possible that weekend handovers may have provided further insight into the content of handovers between nursing team leaders. A limitation of overtly observing behavior is the Hawthorne effect, which may have caused the observed nurses to modify their behavior. Nursing team leader handovers however, had recently been observed during a study examining bedside handover and during hospital-wide auditing of clinical handover, thereby reducing potential bias. The investigators believe that nurses appeared comfortable with having their handovers audiotaped and behavior changes would have been minimal.

CONCLUSION

Our research identifies the content of information discussed during nursing team leader handover that has not been previously investigated. Although all elements of ISBAR were addressed in some handovers, the content of handovers was varied. Furthermore, key concepts outlined in National Safety and Quality Health Service Standard 6 were absent from handovers. These findings indicate that critical patient information is either absent or not consistently transferred at handover, which has the potential to significantly compromise patient safety. This
study will inform the development of a flexible, standardised handover tool specific to nursing team leader to improve communication at handover and the quality of care provided to patients.

ACKNOWLEDGEMENTS

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REFERENCES


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4.3 Phase 2, publication 2

Before this study, there was no standardised, evidence-based handover tool available for nursing TL handover. To identify the content to include in an MDS for nursing TL handover, Phase 1 results were presented to TLs in focus groups. Using these findings and the NGT to generate discussion, TLs determined which content to include in an MDS and recommended additional content not identified in Phase 1 to include in the MDS. The second paper describes the content TLs required in an MDS for shift-to-shift handover. These findings informed the development of the first evidence-based eMDS for nursing TL handover.

Statement of contribution to co-authored published papers

The second co-authored paper in this chapter was accepted for publication with the *Australian Critical Care Journal*. The details of the co-authored paper, including all authors, are:

doi:10.1016/j.aucc.2017.01.005
My contribution to the paper involved

- Critical review of the literature
- Conception and design of the study
- Participant enrolment
- Data collection
- Data cleaning and analysis
- Data interpretation
- Writing of the manuscript
- Revision of the manuscript for important intellectual content
- Approval of the final version

I completed the research and writing of the paper with methodological and editorial advice from my PhD supervisors Professor Wendy Chaboyer and Professor Leanne Aitken and work colleague Amanda Corley.
19/07/2018

Student: Amy Janine Spooner

20/07/2018

Co-author of the paper and supervisor: Professor Wendy Chaboyer

19/07/2018

Co-author of the paper and supervisor: Professor Leanne Aitken

18/07/2018

Co-author of the paper and work colleague: Amanda Corley
Developing a minimum dataset for nursing team leader handover in the intensive care unit: A focus group study

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Key words:
Clinical handover, intensive care unit, minimum dataset, intensive care

Author contribution:
All authors declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We understand that the Corresponding Author is the sole contact for the Editorial process. She is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.
ABSTRACT

Background

Despite increasing demand for structured processes to guide clinical handover, nursing handover tools are limited in the intensive care unit.

Objectives

The study aim was to identify key items to include in a minimum dataset for intensive care nursing team leader shift-to-shift handover.

Methods

This focus group study was conducted in a 21-bed medical/surgical intensive care unit in Australia. Senior registered nurses involved in team leader handovers were recruited. Focus groups were conducted using a nominal group technique to generate and prioritise minimum dataset items. Nurses were presented with content from previous team leader handovers and asked to select which content items to include in a minimum dataset. Participant responses were summarised as frequencies and percentages.

Results

Seventeen senior nurses participated in three focus groups. Participants agreed that ISBAR (Identify-Situation-Background-Assessment-Recommendations) was a useful tool to guide clinical handover. Items
recommended to be included in the minimum dataset (≥65% agreement) included *Identify* (Name, age, days in intensive care), *Situation* (Diagnosis, surgical procedure), *Background* (Significant event(s), management of significant event(s)) and *Recommendations* (Patient plan for next shift, tasks to follow up for next shift). Overall, 30 of the 67 (45%) items in the *Assessment* category were considered important to include in the minimum dataset and focused on relevant observations and treatment within each body system. Other non-ISBAR items considered important to include related to the ICU (Admissions to ICU, staffing/skill mix, theatre cases) and patients (Infectious status, site of infection, end of life plan). Items were further categorised into those to include in all handovers and those to discuss only when relevant to the patient.

**Conclusions**

The findings suggest a minimum dataset for intensive care nursing team leader shift-to-shift handover should contain items within ISBAR along with unit and patient specific information to maintain continuity of care and patient safety across shift changes.
INTRODUCTION

Adverse patient incidents associated with miscommunication during clinical handover remains a recurring problem nationally and globally in healthcare (Australian Commision on Safety and Quality in Health Care, 2008; Johnson & Arora, 2009; Thomas, Schultz, Hannaford, & Runciman, 2013; World Health Organization, 2007). Breakdown in communication accounted for 20% of all reported sentinel events in Queensland (Australia) public hospitals between 2005 and 2006 (World Health Organization, 2007) and the Joint Commission recently reported that poor communication is the leading cause of all sentinel events and that more than one third of all patient handoffs are defective (Joint Commission on Accreditation of Healthcare Organizations, 2012). Gaps in communication has been linked to delays in diagnosis, patients receiving the wrong treatment, breakdown in continuity of care and life threatening adverse events leading to longer hospital stays and increased healthcare expenditure (Ahmed et al., 2012). In Australia, clinical handover is listed as a priority area for patient safety improvement, and has led to the roll out of the National Safety Quality Health Service Standard (NSQHSS) 6 - Clinical handover (Australian Commision on Safety and Quality in Health Care, 2012). To fulfill accreditation standards healthcare organisations are required to have structured handover processes in place, including a minimum dataset (MDS) to handover patient information. Growing awareness of this patient safety issue has led to the development of a wide range of handover resources with an increasing evidence base in this important area (Australian Commision on Safety and Quality in Health Care, 2010b; Australian Commission on Safety and Quality in Health Care, 2011).
The introduction of standardised handover processes ensures all participants know the process and content required to present complex patient information (Australian Commission on Safety and Quality in Health Care, 2010b). Part of the standardised process includes the incorporation of structured handover tools that enable clinicians to deliver handover in a structured format. Commonly used handover tools include SBAR (Situation-Background-Assessment-Recommendation), I-PASS (Illness severity-Patient summary-Action list-Situation awareness-Synthesis by receiver) and SHARED (Situation-History-Assessment-Risk-Expectation-Documentation). While the use of structured handover tools has been linked to improved continuity of care and patient outcomes (Agarwal, Saville, Slayton, Donahue, Daves, Christian et al., 2012; Ahmed et al., 2012; Yee et al., 2009), not all handover tools can be successfully used across all clinical settings. This may be due to the tools containing too much or not enough information, or content that is not applicable to the clinical context. Health care facilities vary widely and have differing functions and size in relation to service delivery, location and workforce (Australian Commission on Safety and Quality in Health Care, 2012). One solution is to utilise flexible standardisation which involves either adapting an established framework or developing a minimum dataset (MDS) that contains content pertinent to the clinical context (Ahmed et al., 2012; Gardiner, Marshall, & Gillespie, 2015; Graan, Botti, Wood, & Redley, 2016; Yee et al., 2009). Recent studies indicate that standardised handover processes encourages more effective handover (Graan et al., 2016; Riesenberg et al., 2010; Yee et al., 2009) and positive patient outcomes (Agarwal et al., 2012). In particular, there are reports of improved handovers, with fewer technical errors (Catchpole et al.,
enhanced clinical performance and clinicians reporting greater knowledge of patients (Riesenberg et al., 2010; Thomas & Donohue-Porter, 2012); higher satisfaction amongst patients (Riesenberg et al., 2010; Thomas & Donohue-Porter, 2012); improved patient safety and reduced costs to the healthcare system (Agarwal et al., 2012; Ahmed et al., 2012).

Despite the availability of a variety of structured handover tools, transferability to the intensive care unit (ICU) can be challenging. The ICU is an event-driven, time-pressured environment prone to continuous distractions. Patients are critically ill and require timely care at a moment’s notice (Smith et al., 2008). The complex and multidisciplinary nature of the ICU renders it susceptible to healthcare errors. Handovers occur frequently in the ICU (e.g., change of shift, meal breaks, admissions, transfers) amongst members of a multidisciplinary team (nurses, doctors and allied health staff). Despite a growing body of research focusing on handovers in adult and pediatric ICUs, relating to admissions to the ICU from the emergency department (McFetridge et al., 2007) or operating theatre (Catchpole et al., 2007; Joy et al., 2011; Kaufman et al., 2013; Segall et al., 2012), nursing bedside shift-to-shift handover (Spooner et al., 2013) and transfers from ICU to the ward (Graan et al., 2016; van Sluisveld, Hesselink, van der Hoeven, Westert, Wollersheim, & Zegers, 2015), little is known about ICU nursing team leader shift-to-shift handover. Unlike bedside nurses that care for one or two patients per shift and discuss detailed patient information at handover, nursing team leaders oversee care provided by bedside nurses, are responsible for the coordination and management of multiple critically ill patients in the ICU and require a succinct overview of patient information. Informative handovers are critical to maintaining patient continuity, safety and a high standard of care,
however no structured process for nursing team leader shift-to-shift handover currently exists. Evidence based handover strategies are urgently required to improve communication transfer during handover to avoid unnecessary patient harm. Therefore, the aim of this study was to identify the key items to include in a MDS for nursing team leader shift-to-shift handover in the ICU.

**METHODS**

This focus group study was conducted over two days during February 2014 in a 21-bed (government funded) adult medical/surgical ICU, specialising in cardiothoracic surgery at a tertiary referral hospital, in Queensland, Australia. Ethical approval was obtained by the institutional and (HREC/10/QPCH/5) and university (NRS/09/13) Human Research Ethics Committee.

**Setting**

There were 180 registered nurses employed in the ICU including 63 senior registered nurses working in team leader roles. The ICU consists of three areas (ICU 1- cardiac surgical, ICU 2/3 – general); each area containing up to nine beds coordinated by one team leader. Handovers occur at the nurses’ station with a maximum of nine patients discussed by each team leader. The ISBAR (Identify-Situation-Background-Assessment-Recommendation) schema was the hospital’s approved handover tool to conduct clinical handover at the study site. The ISBAR schema is widely used in healthcare settings (Haig et al., 2006; Woodhall, Vertacnik, & McLaughlin, 2008) and has undergone extensive testing.
Despite having an approved handover tool at the study site, no standardised or evidence based handover tools were being used. Prior to commencing this study, team leaders could choose up to five different templates that were either developed by individual staff members or printed from an electronic computer system. Team leaders in the two general ICUs predominantly used a template containing the body systems (e.g., Central nervous system, respiratory system, cardiovascular system etc.), the registrars weekly patient summary or a printed template from the hospital computer system (WardView provides a brief summary of the patient's demographics and medical status). Team leaders in the cardiac surgical ICU often used a paper template with a cardiac surgical focus (e.g., surgery type, surgeon, cardiac drainage etc) and/or a template containing the patient’s medical history and clinical events. Although the templates are vastly different they all contained patient identifiers (name, bed number).

**Participants**

Senior ICU registered nurses (Grade 5, 6 and 7 registered nurses) involved in team leader handover were purposively sampled. Grade 5 nurses have successfully completed the ICU transition program and team leader educational package, grade 6 nurses have completed the ICU transition program, Graduate Certificate in Intensive Care and team leader educational package, while grade 7 nurses have postgraduate qualifications and coordinate the clinical and managerial operation of the unit. All team leaders worked across the three ICU
areas. Participant information sheets and consent forms were sent via internal mail to all nursing staff who met the inclusion criteria (Senior ICU registered nurses involved in team leader handover). Potential participants were told about the study at staff meetings and written consent was obtained prior to study commencement. Consent was also confirmed verbally at the time of data collection.

Data collection

Registered nurses involved in team leader handover were invited to attend focus groups. Focus groups occurred over two days, were approximately 90 minutes in length and occurred in a room with space for participants to sit comfortably in a circle to ensure the researcher could maintain eye contact with participants throughout the session. Investigators used a convenience sample to conduct focus groups. As senior nurses working in the ICU were required to leave the unit for an extended period of time, the number of staff available to attend focus groups was dependent on the busyness (patient numbers, patient acuity) and staffing levels (sick calls, skill mix and the availability of staff to cover each other) of the ICU on the study day. Demographic data collected included gender, nursing grade and hours worked per fortnight.

To ensure all participants contributed during the session a nominal group technique (NGT) (Harvey & Holmes, 2012) was used to guide the focus groups. NGT is a structured method, recognised as an efficient and effective methodology to generate and prioritise ideas (Asmus & James, 2005; Harvey & Holmes, 2012; Keatinge et al., 2002). In NGT, data are systematically collected from all
participants to ensure divergent views are reflected in the data. The process prevents the domination of discussion by a single person, encourages passive group members to participate, and results in a set of prioritised solutions or recommendations. NGT assisted the researchers to determine which concepts to include in a MDS for ICU team leader handover.

Focus groups were structured using Keatinge’s (Keatinge, 2000) NGT to generate data (Figure 4.3.1). To commence the NG meeting, an investigator (AS) (the facilitator) clarified the purpose of the meeting, expectations of the participants, asked open ended questions and kept the conversation moving (Gibbs, 1997). A second investigator (TB) audiotaped the discussions; observed the group and made field notes to complement the audio recordings (Bender & Ewbank, 1994). Handouts were given to participants containing content items from team leader handovers. Content within the ISBAR schema, along with additional unit and patient specific content was presented to participants. Using a round robin technique (i.e. each participant takes a turn), participants were asked to state which items from the handout to include/remove from a MDS. Responses were summarised and participants had a final vote on content items to include in a MDS. Participants were asked to suggest additional content items to include in a MDS. A round robin was conducted, responses shared and participants voted and decided which items should be included in a MDS. A final summary of the responses was presented, participants clarified/suggested final recommendations during a round robin and a final vote resulted in a MDS for team leader handover.
Figure 4.3.1. Process of the nominal group technique
Data analysis

Descriptive statistics were used to provide a summary of key items to include in a MDS for nursing team leader handover. Data are presented as frequencies and percentages (Fink, 2009). Audiotapes and field notes from the meeting were used to clarify inconsistencies and further explain data generated. Participants suggested that content could be further stratified into items to include in all handovers and items to include if relevant to the patient e.g., temperature value if the patient was hypo/hyper thermic, wounds if present. Investigators set an agreement threshold at ≥65%, as achieving 2/3 agreement within each of the focus groups was considered appropriate.

RESULTS

Seventeen senior nurses (two males and 15 females) involved in team leader handover consented to participate in focus groups. Three focus groups were conducted containing four, six and seven nurses in each group. Participants included one grade seven nurse, seven grade six nurses and nine grade 5 nurses. Forty-one percent (7) of participants worked full-time in the ICU.

ISBAR items

Specific items within Identify (Name, age, days in ICU), Situation (Diagnosis, surgical procedure), Background (Significant event/s and management of significant event/s) and Recommendations (Patient plan for the next shift, tasks team leader needs to follow up for next shift) were recommended
to be included in a MDS. Patient consultations (e.g., Occupational therapist) and/referrals (e.g., mental health review) within the Recommendation category were suggested only when they were relevant to the patient. All content items within ISBR of the ISBAR schema are presented in Table 4.3.1, while the Assessment items are summarised in Table 4.3.2.
Table 4.3.1 ISBR (Identify-Situation-Background-Recommendations) items

<table>
<thead>
<tr>
<th>ISBAR Categories/sub-categories</th>
<th>Include Frequency (%)</th>
<th>Include if applicable Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Identify</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Name</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Age</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Days in intensive care unit</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Bed number</td>
<td>7 (41)</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Admitting consultant/team</td>
<td>3 (18)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Situation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diagnosis</td>
<td>15 (88)</td>
<td>2 (12)</td>
</tr>
<tr>
<td>Surgical procedure</td>
<td>11 (65)</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Acute resuscitation plan†</td>
<td>10 (59)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Discharge status</td>
<td>7 (41)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Background</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical history</td>
<td>7 (41)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Surgical history</td>
<td>7 (41)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Significant event/s</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Management of significant event/s</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presented in table 4.3.2 and Supplementary table 4.3.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommendations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultations/referrals to specialists</td>
<td>6 (35)</td>
<td>11 (65)</td>
</tr>
<tr>
<td>(conducted in previous shift/planned for next shift)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient plan for next shift/s (determined by daily clinical ward round)</td>
<td>16 (94)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Items Team Leader needs to follow up for next shift</td>
<td>17 (100)</td>
<td>0</td>
</tr>
</tbody>
</table>

†Acute resuscitation plan includes plan for response to life threatening situation (e.g. not for reintubation and one defibrillator shock).
## Table 4.3.2 Assessment items ≥65% agreement

<table>
<thead>
<tr>
<th>Assessment items Categories/Sub-categories</th>
<th>Include Frequency (%)</th>
<th>Include if applicable Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Central nervous system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sedation</td>
<td>14 (82)</td>
<td>3 (18)</td>
</tr>
<tr>
<td><strong>Respiratory system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acknowledges respiratory system</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Abnormal arterial blood gas results</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td><strong>Cardiovascular system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acknowledges cardiovascular system</td>
<td>16 (94)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Rhythm</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>Rhythm management</td>
<td>5 (29)</td>
<td>12 (71)</td>
</tr>
<tr>
<td>Infusions</td>
<td>16 (94)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Heparin/Warfarin</td>
<td>15 (88)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Reason for Heparin/Warfarin</td>
<td>16 (94)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Blood products</td>
<td>15 (88)</td>
<td>2 (12)</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>1 (6)</td>
<td>16 (94)</td>
</tr>
<tr>
<td>Central venous pressure</td>
<td>0</td>
<td>14 (82)</td>
</tr>
<tr>
<td>Temperature</td>
<td>1 (6)</td>
<td>16 (94)</td>
</tr>
<tr>
<td>Haemoglobin level</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td>Potassium level</td>
<td>1 (6)</td>
<td>14 (82)</td>
</tr>
<tr>
<td><strong>Gastrointestinal tract system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acknowledges gastrointestinal tract system</td>
<td>17 (100)</td>
<td>0</td>
</tr>
<tr>
<td>High nasogastric aspirates</td>
<td>0</td>
<td>16 (94)</td>
</tr>
<tr>
<td>Bowels</td>
<td>1 (6)</td>
<td>12 (71)</td>
</tr>
<tr>
<td>Diet</td>
<td>0</td>
<td>14 (82)</td>
</tr>
<tr>
<td>Blood sugar levels</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Renal system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Renal replacement therapy</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td>Renal replacement therapy mode/aims</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td>Urine output</td>
<td>3 (18)</td>
<td>11 (65)</td>
</tr>
<tr>
<td><strong>Skin system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wounds present</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td>Dressing regime</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td>Age of intravascular devices</td>
<td>0</td>
<td>13 (76)</td>
</tr>
<tr>
<td><strong>Social system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family situation</td>
<td>0</td>
<td>17 (100)</td>
</tr>
<tr>
<td>Family meeting</td>
<td>11 (65)</td>
<td>6 (35)</td>
</tr>
</tbody>
</table>
Within the *Assessment* category, participants identified specific content within each body system (central nervous system, respiratory system, cardiovascular system, renal system, gastrointestinal tract system, skin system and social system) to be included in a MDS (Table 4.3.2). Overall, 12 of the 67 (18%) items in the *Assessment* category were considered important to include in a MDS, while 18 of the 67 (27%) items were considered important to include only when relevant to the patient e.g., oxygen saturation was important to include if the patient was weaning from ventilation or was having difficulty maintaining optimal oxygenation levels. *Assessment* items with ≥65% agreement amongst participants with ‘Include’ or ‘Include if applicable’ responses are identified in Table 4.3.2. *Assessment* items with <65% in either the ‘include’ or ‘include if applicable’ are shown in Supplementary Table 4.3.1.
### Supplementary Table 4.3.1. Assessment items with <65% agreement

<table>
<thead>
<tr>
<th>ISBAR schema Categories/Sub-categories n=17</th>
<th>Include Frequency (%)</th>
<th>Include if applicable Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ASSESSMENT (&lt;65% agreement)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central nervous system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Refers to Central Nervous System</td>
<td>7 (41)</td>
<td>4 (24)</td>
</tr>
<tr>
<td>Glasgow Coma Scale</td>
<td>7 (41)</td>
<td>8 (47)</td>
</tr>
<tr>
<td>Pupil Reaction</td>
<td>2 (12)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Limb powers</td>
<td>1 (6)</td>
<td>8 (47)</td>
</tr>
<tr>
<td>Sleeping status</td>
<td>4 (24)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Paralysis medication</td>
<td>10 (59)</td>
<td>5 (29)</td>
</tr>
<tr>
<td>Train of Four score</td>
<td>3 (18)</td>
<td>4 (24)</td>
</tr>
<tr>
<td>Bispectral Index</td>
<td>0 (0)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Pain level</td>
<td>7 (41)</td>
<td>5 (29)</td>
</tr>
<tr>
<td>Pain management</td>
<td>8 (47)</td>
<td>3 (18)</td>
</tr>
<tr>
<td><strong>Respiratory system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extubation status</td>
<td>10 (59)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Airway grade</td>
<td>7 (41)</td>
<td>9 (53)</td>
</tr>
<tr>
<td>Ventilation settings</td>
<td>0 (59)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Oxygen delivery device</td>
<td>8 (47)</td>
<td>2 (12)</td>
</tr>
<tr>
<td>Ventilation/parameters</td>
<td>0 (0)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Respiratory rate</td>
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<tr>
<td>Sputum</td>
<td>0 (0)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Normal arterial blood gas results</td>
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<td>0 (0)</td>
</tr>
<tr>
<td><strong>Cardiovascular system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pacing wires</td>
<td>10 (59)</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Pacing mode</td>
<td>10 (59)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Blood pressure aims/management</td>
<td>5 (29)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Cardiac drainage</td>
<td>7 (41)</td>
<td>10 (59)</td>
</tr>
<tr>
<td>Ventricular assist device settings</td>
<td>5 (29)</td>
<td>5 (29)</td>
</tr>
<tr>
<td>Circulation</td>
<td>9 (53)</td>
<td>8 (47)</td>
</tr>
<tr>
<td>APTT/INR results</td>
<td>3 (18)</td>
<td>2 (12)</td>
</tr>
<tr>
<td>Time APTT/INR due</td>
<td>4 (24)</td>
<td>2 (12)</td>
</tr>
<tr>
<td><strong>Gastrointestinal tract system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nasogastric/orogastic tube present</td>
<td>1 (6)</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Management of high gastric aspirates</td>
<td>2 (12)</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Nausea/vomiting</td>
<td>0 (0)</td>
<td>1 (6)</td>
</tr>
<tr>
<td>Management of abnormal blood sugars</td>
<td>5 (29)</td>
<td>7 (41)</td>
</tr>
<tr>
<td><strong>Renal system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management of urine output</td>
<td>8 (48)</td>
<td>9 (52)</td>
</tr>
<tr>
<td>Refers to indwelling catheter</td>
<td>0 (0)</td>
<td>6 (35)</td>
</tr>
<tr>
<td>Full blood count results</td>
<td>1 (6)</td>
<td>9 (53)</td>
</tr>
<tr>
<td><strong>Skin system</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure areas present</td>
<td>10 (59)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Wound chart</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>PRIME incident reports</td>
<td>5 (29)</td>
<td>7 (41)</td>
</tr>
<tr>
<td>Hygiene cares</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
</tbody>
</table>
Non-ISBAR items

There were other items not related to the ISBAR mnemonic that participants considered important to include in a MDS (Table 4.3.3). These included *unit flow and management* (Admissions to ICU, staffing/skill mix, theatre cases), *patient alerts* (Infectious status, site of infection) and *additional patient updates* (End of life plan), while *unit administrative tasks* such as dangerous drug orders, equipment issues and patient menus/orders completed were not considered necessary to discuss at handover. Items within the *additional patient updates* category (Patient behavior, scheduled investigations) were considered important to include in handover only if relevant to the patient.
Table 4.3.3 Non-ISBAR items

<table>
<thead>
<tr>
<th>Categories/sub-categories</th>
<th>n=17</th>
<th>Include Frequency (%)</th>
<th>Include if applicable Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT SPECIFIC INFORMATION</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Unit flow and management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Admissions to ICU</td>
<td>16 (94)</td>
<td>1 (6)</td>
<td></td>
</tr>
<tr>
<td>Bed movements</td>
<td>4 (24)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Staffing/skill mix</td>
<td>17 (100)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Theatre cases</td>
<td>17 (100)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Unit administrative tasks</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dangerous drug orders</td>
<td>0</td>
<td>4 (24)</td>
<td></td>
</tr>
<tr>
<td>Equipment issues</td>
<td>9 (53)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Patient menus/orders completed</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PATIENT SPECIFIC INFORMATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient alerts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Allergies</td>
<td>7 (41)</td>
<td>5 (29)</td>
<td></td>
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<tr>
<td>Falls risk</td>
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<td>5 (29)</td>
<td></td>
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<tr>
<td>Infectious status</td>
<td>17 (100)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Site of infection</td>
<td>16 (94)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Precautions</td>
<td>0</td>
<td>4 (24)</td>
<td></td>
</tr>
<tr>
<td>PRIME clinical incident reporting system</td>
<td>1 (6)</td>
<td>10 (59)</td>
<td></td>
</tr>
<tr>
<td>Additional patient updates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotics</td>
<td>1 (6)</td>
<td>6 (35)</td>
<td></td>
</tr>
<tr>
<td>End of life plan*</td>
<td>17 (100)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Mobility</td>
<td>1 (6)</td>
<td>8 (47)</td>
<td></td>
</tr>
<tr>
<td>Patient behaviour</td>
<td>0</td>
<td>17 (100)</td>
<td></td>
</tr>
<tr>
<td>Patient weight</td>
<td>0</td>
<td>6 (35)</td>
<td></td>
</tr>
<tr>
<td>Scheduled investigations</td>
<td>0</td>
<td>17 (100)</td>
<td></td>
</tr>
<tr>
<td>Patient consent to follow up</td>
<td>2 (12)</td>
<td>3 (18)</td>
<td></td>
</tr>
<tr>
<td>Patient on research study</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*End of life care includes broader plan for dying patient (e.g. pain relief, feeding regime, family involvement in care).

Additional patient updates to be included in handover

Participants were asked to suggest other items that could be included in a MDS. Although several items were discussed during focus groups, only two additional items – patient’s surgeon (17/17, 100%) and ICU consultant in charge
for the week/weekend (11/17, 65%) achieved consensus for inclusion in the MDS.

DISCUSSION

This study identified content for inclusion in a MDS for nursing team leader shift-to-shift handover. Content included items within the ISBAR schema, non-ISBAR and additional items recommended by team leaders. Nursing team leaders identified content that should be included in all shift-to-shift handovers and content that could be included in handovers if relevant/pertinent to the patient. Items relevant to all handovers tended to focus on the summary of patient management (e.g., significant event(s), management of significant event(s), current health assessment, future patient plans and organisational issues). Further detail within patient health assessments was deemed important to include in handovers if relevant to the patient (e.g., renal replacement therapy, dressing regime for wounds).

Through engaging the nurses involved in handover the investigators were able to identify key items to include in a MDS for nursing team leader handover. Engaging key stakeholders in the development of interventions such as a MDS for team leader handover is crucial to ensuring the intervention is relevant to the clinical context, meets the needs of the users and can be successfully implemented and utilised (Siriwardena, 2009). While it is important to engage the key users when developing an intervention for practice change it is also imperative that the intervention meets the local/national/international standards and guidelines to ensure high standards of care and patient safety is maintained
Our research identified several content items within the ISBAR schema that team leaders did not consider necessary to include in handover that are mandatory items within the NSQHSS 6. These items include patient bed number, admitting consultant/team (Identify); acute resuscitation plans, discharge status (Situation); and medical, surgical history (Background).

The ISBAR schema is one of several tools recommended by the ACSQHC to help guide clinicians with the transfer of patient information during handover and was the approved tool to use for handover at the study site (Australian Commission on Safety and Quality in Health Care, 2011). To adequately Identify a patient during handover three forms of identity (patient name, date of birth and medical identification number) are recommended to avoid misidentification and mismatching of patient management (Australian Commission on Safety and Quality in Health Care, 2012). A previous study conducted in the ICU found that medical identification number was not mentioned during team leader handovers (Spooner, Aitken, Corley, Fraser, & Chaboyer, 2016) and nor was it recommended for inclusion during focus groups in this study. In addition, team leaders were impartial when deciding whether bed number should be included in all handovers or included if applicable to the patient. Team leaders also considered the inclusion of admitting medical consultant/team to be unnecessary which could compromise patient outcomes such as causing delays in treatment if the appropriate physician is not notified promptly of changes in patient conditions.

Within the Situation category team leaders were impartial as to whether acute resuscitation plan and discharge status should be mentioned in all
handovers or only when applicable e.g., some team leaders considered acute resuscitation plan necessary to mention if a specific plan had been documented, otherwise it was not important to mention in handover. Similarly, within the Background category of the ISBAR schema team leaders were divided as to whether medical and surgical history should be mentioned in all handovers or only when applicable to the patient. These results show there were varied opinions amongst team leaders regarding the content to include in a MDS. The advantages of structured tools such as MDSs is that they minimise individual biases as to what information is deemed “important” (Keebler, Lazzara, Patzer, Palmer, Plummer, Smith et al., 2016). Standardised frameworks are objective and outline the minimum content that must be contained and transferred during handover (Australian Commision on Safety and Quality in Health Care, 2010b; Keebler et al., 2016). These findings also suggest a lack of awareness or understanding amongst clinicians in relation to current standards and guidelines for the delivery of safe clinical handovers (Cabana et al., 1999; Leone, Ragonnet, Alonso, Allaouchiche, Constantin, Jaber et al., 2012). While it is important to develop an evidence-based MDS that meets the needs of the clinicians and context, it is also imperative that clinical practice and patient safety is not compromised due to the omission of critical patient information at handover.

Within the Assessment category team leaders identified items to include in a MDS for handover. While Spooner et al’s (Spooner et al., 2016) study identified a large number of items discussed in this category, focus group participants considered less than half of these items to be relevant to include in all handovers or when applicable to the patient. These findings indicate that team leaders would rather obtain a concise summary of the most pertinent patient assessment
information. Unlike bedside nurses that handover detailed patient assessment information of one or two patients, team leaders’ handover up to nine patients in the same allocated timeframe. The transition from bedside nurse to team leader may prove challenging when determining what information to discuss in this category at handover. A structured MDS may be a beneficial way to reduce unnecessary content discussed at handover and assist clinicians to prepare and deliver succinct and timely handovers.

Our research showed that alongside the ISBAR schema, participants considered information specific to the unit and patient to be important. The ICU has been identified as one of the major areas where patient flow can be problematic. Once the ICU is at capacity, unless patients are well enough to be transferred to the ward to make a bed available for an admission, patients are unable to be transferred to another area within the hospital and no further patients can be admitted to the ICU. Clinical handovers that contain information regarding patient flow (e.g., planned/emergency admissions into and transfers out of ICU) may assist nursing team leaders to plan and optimise patient flow within the ICU, thereby minimising delays in patients receiving timely and efficient care (Institute for Healthcare Improvement, 2003). These findings add to the current literature and inform the development of an evidence-based MDS incorporating a modified ISBAR schema along with specific ICU and patient details required by team leaders to deliver informative shift-to-shift handovers.
Recommendations for practice

The ICU is a high risk environment containing critically ill patients that can become unstable with little warning. Clinicians rely on informative handovers to maintain continuity of care. While there are many resources available for clinicians to assist with the handover process, there are limited resources that can be applied in the ICU setting. It is imperative that handover tools are either modified or MDSs are developed to meet the needs of the clinical context such as ICU to avoid incomplete, inconsistent or inaccurate information that could compromise patient safety (Australian Commission on Safety and Quality in Health Care, 2010b). Furthermore, clinician engagement is essential to ensure MDSs contain information relevant to the setting. Clinician involvement may also increase the likelihood the tool will be accepted and adopted by clinicians (Lewin, 1997). Alongside clinician engagement investigators need to also ensure tools comply with local guidelines and national standards. Further work is required to evaluate whether ICU specific MDSs improve handover communication and reduce adverse patient events in the ICU.

Limitations

This study was conducted in one ICU and the sample size was small, however it was representative of all levels of nurses involved in team leader handover. A larger sample size containing more full-time nurses may have provided further insight into the content required in a MDS. Although focus groups are a valuable way to obtain a large amount of information in a short timeframe, group dynamics and varying opinions can silence participants. To ensure all
participants contributed during focus groups a NGT was utilised to structure the sessions, promote rich discussions and allow individuals to be heard.

CONCLUSION

Our research findings identified items within the ISBAR schema and additional items necessary to include in a MDS for ICU nursing team leader shift-to-shift handover. Specific items were proposed for inclusion in all clinical handovers, while other items were considered only necessary to discuss if relevant to the patient. These findings will inform the development of the first evidence-based MDS for nursing team leader handover in the ICU. This MDS may be adaptable to other hospital ICUs that lack structured, evidence based resources to guide the handover of critical patient information. Our MDS aims to provide a structured, informative handover that assists team leaders to maintain continuity of care and provide patients with a high standard of care.
ACKNOWLEDGEMENTS

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REFERENCES


junior medical officer handover: a study in an Australian tertiary hospital.


4.4 Phase 3

4.4.1 Phase 3, publication 3

In Phase 2 the first evidence-based MDS was developed for nursing TL shift-to-shift handover. Phase 3 consists of three parts. In part 1, prior to the implementation of the eMDS, it was necessary to identify factors that would impede or facilitate TLs’ uptake of the handover tool. A survey was distributed to TLs to identify the barriers and facilitators to eMDS use. This paper presents the barriers and facilitators to eMDS use that have not been previously investigated. These findings informed the selection of strategies focused on user needs (barriers and facilitators) during eMDS implementation.

**Statement of contribution to co-authored published paper**

The third co-authored paper in this chapter was accepted for publication with the *Australian Critical Care Journal*. The details of the co-authored paper, including all authors, are:


My contribution to the paper involved:

- Critical review of the literature
- Conception and design of the study
- Participant enrolment
- Data collection
- Data cleaning and analysis
- Data interpretation
- Writing of the manuscript
- Revision of the manuscript for important intellectual content
- Approval of the final version

I completed the research and writing of the paper with methodological and editorial advice from my PhD supervisors Professor Wendy Chaboyer and Professor Leanne Aitken.
19/07/2018

Date ________________

Student: Amy Janine Spooner

20/07/2018

Date ________________

Co-author of the paper and supervisor: Professor Wendy Chaboyer

19/07/2018

Date ________________

Co-author of the paper and supervisor: Professor Leanne Aitken
Barriers and facilitators to the implementation of an evidence-based electronic minimum dataset for nursing team leader handover: A survey

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Key words:
Intensive care unit, minimum dataset, handover, nursing, barriers, facilitators
Author contribution:

All authors declare that this manuscript is original, has not been published before and is not currently being considered for publication elsewhere. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship and are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us. We understand that the Corresponding Author is the sole contact for the Editorial process. She is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.
ABSTRACT

Introduction

There is widespread use of clinical information systems in intensive care units however, evidence-based electronic tools to support handover are limited.

Objectives

The study aim was to assess the barriers and facilitators to use of an electronic minimum dataset for nursing team leader shift-to-shift handover in the intensive care unit.

Methods

The study was conducted in a 21-bed medical/surgical intensive care unit, specialising in cardiothoracic surgery at a tertiary referral hospital, in Queensland, Australia. An established tool was modified to the handover context and a survey of nursing team leaders was undertaken. Survey statements were rated using a 6-point Likert scale with selections from ‘strongly disagree’ to ‘strongly agree’, and open-ended questions. Descriptive statistics were used to summarise results.

Results and Discussion

Team leaders used general intensive care work unit guidelines to inform practice however team leaders were less familiar with the intensive care handover work unit guideline. Barriers to minimum dataset uptake included: a tool that was not user friendly, time consuming and contained too much information. Facilitators to minimum dataset adoption included: a tool that was
user friendly, saved time and contained relevant information. Identifying the complexities of a healthcare setting prior to the implementation of an intervention assists researchers and clinicians to integrate new knowledge into healthcare settings.

**Conclusion**

Barriers and facilitators to knowledge use focused on usability, content and efficiency of the electronic minimum dataset and can be used to inform tailored strategies to optimise team leaders’ adoption of a minimum dataset for handover.
INTRODUCTION

Clinical handover is an essential part of clinical care, that occurs several times in the day when there is a changeover of responsibility and accountability of some or all aspects of patient/s care from outgoing to oncoming health care clinicians and teams (Ahmed et al., 2012). In the last decade, failures in communication during clinical handover have been identified as a major preventable cause of patient harm. Gaps in communication have been linked to delays in diagnosis, patients receiving the wrong treatment, breakdown in continuity of care and life threatening adverse events leading to longer hospital stays and increased healthcare expenditure (Ahmed et al., 2012). Improving communication during clinical handover is a major safety goal led by the World Health Organization (World Health Organization, 2007), the Joint Commission in the USA (Shamji, Baier, Gravenstein, & Gardner, 2014) and more recently the Australian Commission on Safety and Quality in Healthcare (ACSQHC) (Australian Commission on Safety and Quality in Healthcare, 2008). This has led to the development of policies, guidelines and handover resources to standardise the content and process of clinical handover.

Although various handover tools have been implemented successfully in ward areas, there are limited resources available for use in the intensive care (ICU) setting. The ICU is an event-driven, time-pressured environment; patients are critically ill and require timely care at a moment’s notice (Smith et al., 2008). The complex and multidisciplinary nature of the ICU environment renders it susceptible to medical errors. While there is published research related to ICU bedside nursing handover (Miller et al., 2009a; Spooner et al., 2013), handover between theatre and ICU (Catchpole et al., 2007; Joy et al., 2011; Kaufmnan et
al., 2013; Segall et al., 2012), emergency to ICU (McFetridge et al., 2007), multidisciplinary handover in the ICU (Miller et al., 2009a), end of life care (Ganz et al., 2015) and interruptions during handover (Gupta et al., 2013; Spooner et al., 2015), little is known about ICU team leader handover or the use of electronic handover tools in the ICU.

Unlike ICU bedside nurses who care for one or two patients per shift and discuss detailed patient information at handover, nursing team leaders not only oversee care provided by bedside nurses, they are responsible for the coordination and management of multiple critically ill patients in the ICU. Currently in Australian ICUs, clinical information systems (CIS) are being rolled out and will lead to ICUs being paperless settings. While there are reported benefits of CIS such as increased efficiency and decreased handover and ward round times, there is a severe lack of evidence-based handover tools within CIS, adding another layer of complexity to clinicians and nursing team leaders being able to carry out structured, informative and succinct handovers in the ICU (Balka et al., 2013; Li, Ali, Tang, Ghali, & Stelfox, 2013; Ryan, O'Riordan, Tierney, Conlon, & Ridgway, 2011). Previous work has identified the content required for nursing team leader shift-to-shift handover informing the development of an evidence-based electronic minimum dataset (MDS) for nursing team leader shift-to-shift handover but integrating new evidence such as a MDS into practice may be challenging (Spooner, Aitken, Corley, & Chaboyer, 2018c).

Translation of evidence into practice is a dynamic and interactive process aimed at strengthening the healthcare system by improving treatment and care provided to patients (Graham & Tetroe, 2008). Knowledge translation however, can be hindered by a multitude of factors such as the size of the facility, cultural
and social setting (Braithwaite et al., 2014) leading to inadequate uptake of evidence-based practice in healthcare settings (Kitson & Harvey, 2016). The use of knowledge translation frameworks is one strategy gaining popularity among clinicians to breakdown the knowledge-translation gap (Davison, Ndumbe-Eyoh, & Clement, 2015; Field et al., 2014). Potential benefits include a structured and systematic process to integrate new knowledge into practice, resulting in greater likelihood of adoption and sustainability (Field et al., 2014; Ilott, Gerrish, Booth, & Field, 2013; Rycroft-Malone & Bucknall, 2010; Tabak, Khoong, Chambers, & Brownson, 2012).

Knowledge To Action (KTA) is one of the most frequently used conceptual frameworks for knowledge translation (Field et al., 2014). Developed by Graham and colleagues in the 2000s, the KTA comprises of two components: Knowledge Creation and the Action Cycle. Each component involves several phases which overlap and can be iterative. Using the KTA framework (phase three of the action cycle) the barriers and facilitators to use of an evidence-based electronic MDS for nursing team leader shift-to-shift handover were assessed in preparation for implementation of a CIS MDS.

METHODS

Setting

A cross-sectional survey was conducted during December 2015 in a 21-bed (government funded) adult medical/surgical ICU, specialising in cardiothoracic surgery at a tertiary referral hospital, in Queensland, Australia. There were 180 registered nurses employed in the ICU including 63 senior registered nurses
working in team leader roles. The ICU consists of three areas (ICU 1 - cardiac surgical, ICU 2 and 3 – general); each area containing up to nine beds coordinated by one team leader. Ethical approval was obtained by the institutional (HREC/10/QPCH/5) and university (NRS/09/13) Human Research Ethics Committee.

Participants

All senior ICU registered nurses (Grade 5 and 6 registered nurses) involved in team leader handover were invited to participate in the study. Grade 5 nurses have successfully completed the ICU transition program and team leader educational package, while grade 6 nurses have in addition a Graduate Certificate in Intensive Care. All team leaders worked across the three ICU areas. Participant information sheets and consent forms were sent via internal mail to all nursing staff who met the inclusion criteria (senior ICU registered nurses involved in team leader handover). Potential participants were told about the study at staff meetings and written consent was obtained prior to study commencement. Consent was also confirmed verbally at the time of data collection.

Data collection

Surveys were distributed to all team leaders and an opaque envelope to collect completed surveys was provided. The 36-item survey instrument “Attitudes Regarding Practice Guidelines” was originally developed by Cabana and colleagues to examine general knowledge, attitudes and behaviours of
healthcare professionals towards practice guidelines in general and specific areas of interest like the Hand Hygiene Guideline (Cabana et al., 1999; Quiros et al., 2007). This survey tool has been successfully used to identify barriers and facilitators to knowledge use in several studies (Gravel et al., 2006; Larson, 2004) and was adapted to the ICU clinical handover context in this study to identify barriers and facilitators to MDS use amongst team leaders. The tool used a 6-point Likert scale with selections from ‘strongly disagree’ to ‘strongly agree’, and consisted of three sections 1) demographics (gender, employment position and level, total number of years as a registered nurse, team leader and years worked in the ICU), 2) attitudinal statements about general ICU guidelines (14-items) and 3) attitudinal statements (20-items) and dichotomous questions relating to ICU handover guidelines, handover structure and an electronic MDS. In addition, participants were asked open ended questions regarding factors that would either facilitate or impede MDS use at handover and to self-report how often electronic and paper handover templates were used during handover.

Construct validity of the tool's domains was originally confirmed by hypothesis testing in Cabana and colleagues’ previous work (Cabana et al., 1999). The survey tool was modified for use in the current study and underwent further scrutiny by an expert panel in ICU including a PhD supervisor, a Quality and Safety Clinical Nurse Consultant, Clinical Nurse, Clinical Nurse Teacher, Clinical Nurse Consultant and Nurse Researcher in ICU for readability, understandability, ease of response, and content validity (face validity and content validity index) and relevant revisions were made until the content validity index reached more than 0.8 agreement (Fink, 2009; Polit & Beck, 2012). The survey tool was pilot tested at two different time points by ten TLs in the ICU and
reliability percentages were calculated to examine both test-retest reliability and internal consistency (93% of nursing team leaders had perfect agreement or 1-point difference in responses at two time points) of overall barriers and facilitators.

Data analysis

Descriptive statistics were calculated to provide a summary of barriers and facilitators to knowledge use relating to general ICU and handover ICU work unit guidelines, handover structure and electronic MDSs. Data are presented as median, interquartile range and frequencies (percentages) (Fink, 2009). The frequency of recurring responses to dichotomous and open ended questions were also summarised.

RESULTS

Thirty-nine (62%) nursing team leaders completed the survey. Participants were predominantly females (31, 91%), aged between 41 and 45 years (9, 23%) and approximately half of the participants worked part-time. Half of the participants had been nursing for more than 21 years with a median of 15 years (IQR 8) spent in ICU and 13 years (IQR 8) working as an ICU team leader (Table 4.4.1.1). Team leaders predominantly used a paper handover form (36, 100%) to conduct handover as well as templates from the CIS (16, 44%) and other prompts (8, 22%) (e.g. a typed medical handover summary, WardView database). One team leader used no prompts (no paper or CIS templates) to carry out handover.
Table 4.4.1.1 Participant demographics

<table>
<thead>
<tr>
<th>Demographics (n=39)</th>
<th>Frequency (%)</th>
<th>Median</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work status</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>16 (41)</td>
<td>36hrs/wk</td>
<td>10</td>
</tr>
<tr>
<td>Part-time</td>
<td>22 (56)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 25</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-30</td>
<td>2 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-35</td>
<td>7 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35-40</td>
<td>7 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>41-45</td>
<td>9 (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46-50</td>
<td>5 (13)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51-55</td>
<td>4 (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>56-60</td>
<td>2 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-65</td>
<td>2 (5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 66</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>3 (9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>31 (91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 5 Registered Nurse</td>
<td>10 (28)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 6 Clinical Nurse</td>
<td>26 (72)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of years nursing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤ 5</td>
<td>0 (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>6 (16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-20</td>
<td>14 (37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ 21</td>
<td>18 (47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of years working in ICU</td>
<td>15</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Number of years working as a Team</td>
<td>13</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.4.1.2 reports on the barriers and facilitators to the use of an electronic MDS for nursing team leader handover. Most nursing team leaders were familiar with ICU work unit guidelines and agreed they were readily available, important, standardised care, improved nurses’ knowledge and patient outcomes (median 5) however, only approximately 60% of team leaders were aware or had read the ICU clinical handover work unit guideline. Although the use of general work unit guidelines rated higher than handover guidelines, most team leaders considered the introduction of a structured, electronic handover tool
would be beneficial to ICU patients. Team leaders surveyed agreed that the ICU clinical handover work unit guideline would assist team leaders to deliver handovers containing relevant content and decrease the likelihood of miscommunication during handover (median 4).
Table 4.4.1.2 **Barriers and facilitators to the use of an electronic minimum dataset**

<table>
<thead>
<tr>
<th>Questions</th>
<th>Median</th>
<th>IQR</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ICU WUGs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am familiar with work unit guidelines in ICU</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WUGs help to improve my knowledge in ICU</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>There are so many WUGs it is nearly impossible to keep up</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>In ICU, I find WUGs readily available</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I don’t have time to stay informed about available WUGs</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WUGs are practical to use</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Generally, WUGs are cumbersome and inconvenient</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WUGs are difficult to apply to my specific practice</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>In ICU, WUGs are important</td>
<td>5</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>WUGs improve patient outcomes</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WUGs interfere with my professional autonomy</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Generally, I would prefer to continue my routines and habits rather than use WUGs</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I am not really expected to use WUGs in ICU</td>
<td>0</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>WUGs help to standardise care</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Clinical handover WUGs</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am aware that Clinical Handover ICU WUG exists</td>
<td>26 (67)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I have read the clinical handover ICU WUG</td>
<td>24 (62)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I conduct handover in line with the ICU Clinical Handover WUG</td>
<td>24 (65)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Clinical Handover WUG is readily accessible if I want to refer to it</td>
<td>4</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>If I use the Clinical Handover WUG in ICU, it will decrease the likelihood of miscommunication during nursing Team Leader handovers</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>If I follow the Clinical Handover WUG it is likely that my TL handovers will contain relevant information</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td><strong>Handover structure</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A structured TL handover tool would be beneficial to ICU patients</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>The ICU NUM/CNC expects me to use a structured handover tool during TL handover</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Use of a structured handover tool will be based on sound scientific evidence</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I don’t wish to change my handover practices, when a structured handover tool is implemented for TL handover</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>A structured handover tool for TL handover has the potential to be cumbersome and inconvenient</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>I do not have time to use a structured handover tool for TL handover</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td><strong>Electronic handover tool</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An electronic handover tool would be beneficial to ICU patients</td>
<td>4</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>I do not wish to change my handover practices, when an electronic handover tool is implemented for TL handover</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>An electronic handover tool has the potential to be cumbersome and inconvenient</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>I would prefer to use an electronic handover tool rather than a paper based handover tool</td>
<td>3</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>I do not wish to carry out TL handover at the bedside</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td><strong>At TL handover, I use the following items to conduct handover</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paper handover form</td>
<td>(3 unknown)</td>
<td>36 (100%)</td>
<td></td>
</tr>
<tr>
<td>MetaVision templates</td>
<td>(3 unknown)</td>
<td>16 (44%)</td>
<td></td>
</tr>
<tr>
<td>Nothing</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>(3 unknown)</td>
<td>8 (22%)</td>
<td></td>
</tr>
</tbody>
</table>

0=Strongly disagree, 1=Disagree, 2=Somewhat disagree, 3=Somewhat agree, 4=Agree, 5=Strongly agree

*WUG – work unit guideline
**TL – Team Leader
***NUM – Nurse Unit Manager
****CNC – Clinical Nurse Consultant

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Thirty-two (82%) team leaders surveyed made recommendations to facilitate use of a structured, electronic handover tool (Table 4.4.1.3). Items recommended more than three times relating to the structure of the MDS included: a tool that was user friendly, containing relevant patient information, structured, consistent and saves time. Items relating to the electronic handover tool included: a tool that was user friendly, containing relevant and up to date patient information.

**Table 4.4.1.3 Facilitators to the use of a structured electronic minimum dataset for nursing Team Leader handover**

<table>
<thead>
<tr>
<th>Structure</th>
<th>Frequency (%)</th>
<th>eMDS</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>User friendly (simple)</td>
<td>11 (32%)*</td>
<td>User friendly</td>
<td>15 (47%)*</td>
</tr>
<tr>
<td>Saves time</td>
<td>8 (25%)*</td>
<td>Contains relevant</td>
<td>7 (22%)*</td>
</tr>
<tr>
<td>Containing all information</td>
<td>7 (22%)*</td>
<td>information</td>
<td></td>
</tr>
<tr>
<td>Consistent</td>
<td>6 (19%)*</td>
<td>Up to date</td>
<td>4 (13%)*</td>
</tr>
<tr>
<td>Structured/comprehensive</td>
<td>6 (19%)*</td>
<td>Saves time</td>
<td>4 (13%)*</td>
</tr>
<tr>
<td>Succinct</td>
<td>3 (9%)</td>
<td>Quick to use</td>
<td>3 (9%)</td>
</tr>
<tr>
<td>Reduced interruptions</td>
<td>2 (6%)</td>
<td>Succinct</td>
<td>3 (9%)</td>
</tr>
<tr>
<td>Dependent on number of patients in ICU</td>
<td>1 (3%)</td>
<td>Reliable</td>
<td>2 (6%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Structured</td>
<td>2 (6%)</td>
</tr>
<tr>
<td>Easy to access</td>
<td>1 (3%)</td>
<td>Easy to add information</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Flexible</td>
<td>1 (3%)</td>
<td>Facilitates bedside</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Improved patient outcomes</td>
<td>1 (3%)</td>
<td>handover</td>
<td></td>
</tr>
<tr>
<td>Supported from line managers</td>
<td>1 (3%)</td>
<td>Limited abbreviations</td>
<td>1 (3%)</td>
</tr>
<tr>
<td>Tried and tested</td>
<td>1 (3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to date</td>
<td>1 (3%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Items recommended more than three times by Team Leaders
Twenty-six (67%) nurses surveyed suggested factors that would impede the use of a structured, electronic handover tool (Table 4.4.1.4). Barriers to the use of a structured handover tool included: a tool that is not user friendly, contains too much information and is time consuming. Factors that would impede the use of an electronic handover tool included: a MDS that was time consuming, slow to upload and not user friendly.

Table 4.4.1.4 Barriers to the use of a structured electronic minimum dataset for nursing Team Leader handover

<table>
<thead>
<tr>
<th>Structure</th>
<th>Frequency (%)</th>
<th>eMDS</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not user friendly</td>
<td>7 (27%)*</td>
<td>Slow to upload</td>
<td>6 (23%)*</td>
</tr>
<tr>
<td>Time consuming</td>
<td>5 (19%)*</td>
<td>Time consuming</td>
<td>6 (23%)*</td>
</tr>
<tr>
<td>Too much information</td>
<td>5 (19%)*</td>
<td>Not user friendly</td>
<td>4 (15%)*</td>
</tr>
<tr>
<td>Access</td>
<td>2 (8%)</td>
<td>Access</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Different structure</td>
<td>2 (8%)</td>
<td>Font big enough to read</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Missing information</td>
<td>2 (8%)</td>
<td>Information in different areas</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Cluttered</td>
<td>1 (4%)</td>
<td>Information not accurate</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Not up to date</td>
<td>1 (4%)</td>
<td>Learning how to use it</td>
<td>2 (8%)</td>
</tr>
<tr>
<td>Staff resistant to change</td>
<td>1 (4%)</td>
<td>Staff resistant to change</td>
<td>2 (8%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cumbrous</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Device not working</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Losing device</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Need a mobile device</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time to prepare</td>
<td>1 (4%)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Uniformity</td>
<td>1 (4%)</td>
</tr>
</tbody>
</table>

* Items recommended more than three times by Team Leaders

**DISCUSSION**

The KTA framework influenced the investigators’ decision to examine the barriers and facilitators to nursing team leaders’ uptake of an electronic MDS for
shift-to-shift handover in preparation for implementation in the ICU. Participants were experienced nurses that had been working in ICU and team leading for several years and used a variety of paper and electronic templates to conduct handover. Overall, team leaders used general ICU work unit guidelines to inform practice however, team leaders were less familiar and likely to use the ICU handover work unit guideline to guide handovers. Several barriers and facilitators related to the usability of the MDS, content and efficiency of the handover tool.

Identifying the complexities of a healthcare setting prior to the implementation of an intervention is one of several phases in the KTA framework that assists researchers and clinicians to integrate new knowledge into healthcare settings (Rycroft-Malone & Bucknall, 2010). Through engaging with key stakeholders, barriers and facilitators to change can be identified. In this context nurses identified barriers related to the structure of the handover tool which can be used to inform the format and layout of MDSs prior to use in the ICU. In addition, we identified barriers relating to knowledge deficits around ICU handover work unit guidelines and nurses reported using multiple templates to conduct handover. The use of multiple templates to conduct handover limits nurses’ ability to carry out structured handovers and has the potential to lead to inaccurate or omission of critical patient information which could result in serious adverse patient events (Greenberg et al., 2007; Joy et al., 2011). These findings can inform implementation strategies targeting barriers (e.g. knowledge deficits) to optimise knowledge and handover practices and promote adoption of the MDS to improve handover and patient safety in the ICU.

Knowledge translation in healthcare settings is imperative to ensure clinicians are providing a high standard of patient care that optimises patient
outcomes however, it is also important to ensure evidence-based interventions are relevant to the user and clinical setting to enhance clinician adoption (Davison et al., 2015). Although the content of the electronic MDS for ICU nursing team leader handover was based on a previous study that identified the content items required in a MDS to meet team leader needs, the results indicate that usability, structure, consistency and efficiency of the tool were key determinants that would facilitate nurses’ uptake of the tool. These findings highlight the importance of creating an electronic MDS interface within the CIS that facilitates seamless and time-saving handovers and content that is pertinent to the clinician and clinical setting.

The introduction of CIS containing applications for electronic clinical handover is gaining popularity with some studies reporting increased efficiency, reduced time spent handwriting notes, decreased duration of handovers and ward rounds, increased adherence to handover protocols and finishing work on time (Balka et al., 2013; Staggers, Clark, Blaz, & Kapsandoy, 2011). The findings however, indicate that an inefficient electronic MDS (time consuming, slow to upload and not user friendly) would impede nurses’ acceptability and willingness to use an electronic MDS for handover; and the advantages of electronic applications listed above would not be realised. According to Davis’ Technology Acceptance Model, perceived usefulness and ease of use are main predictors of patient acceptance of consumer health information (Or & Karsh, 2009). This may also apply to nurses and other health professionals’ motivation to use an electronic MDS for handover. Usability is achieved through ensuring the program (electronic MDS) can be used by a population (nursing team leaders in ICU) to achieve goals with effectiveness, efficiency and satisfaction within a specific
context (handover) (Yen & Bakken, 2012). Therefore, when developing and implementing electronic handover tools it is important to form interdisciplinary partnerships, work with a skilled information technology team to build a flexible interface that can be modified to accommodate user needs, meet national and local standards and support the application’s reliability and end-user satisfaction (Roberts, Chaboyer, Gonzalez, & Marshall, in press; Saleem, Plew, Speir, Herout, Wilck, Ryan et al., 2015; Yen & Bakken, 2012)

**Recommendations for practice**

Identifying the barriers and facilitators to knowledge use, a phase in the KTA framework, is imperative to identifying the challenges researchers and clinicians may face when implementing a new intervention into practice. These findings will inform future research to select and develop strategies to translate knowledge into practice (Rycroft-Malone & Bucknall, 2010). It is clear these strategies will need to complement the facilitators and target the barriers identified in this study such as knowledge deficits relating to handover and the structure and usability of the tool prior to implementation in the ICU.

Paperless ICUs that rely on CIS is the way of the future (Huang & Lee, 2011). The integration of evidence-based handover interfaces into CIS is critical to ensuring nursing team leaders are communicating effectively during handover, carrying out a high standard of care and maintaining patient continuity despite multiple shift changes. The use of theoretical frameworks that focus on user-task-system-interaction to promote usability is needed to guide the implementation and evaluation process of electronic interfaces in healthcare settings (De
Limitations of the study

The study was conducted in one ICU therefore the barriers and facilitators may not be generalizable to other ICUs. The CIS however, is currently being rolled out in ICUs globally and the study could be replicated at other sites prior to implementation of electronic interfaces. Despite a small sample size there was a good response rate and the findings are representative of nursing team leaders’ in the ICU. Also, the original survey tool was modified for the ICU context, therefore the survey underwent further psychometric testing and demonstrated evidence of its reliability and content validity.

CONCLUSION

It is essential that researchers and clinicians understand the complexities of healthcare settings prior to implementing practice changes. Our findings indicate that handover knowledge, usability, relevance of information and efficiency of the electronic MDS would be factors that would either impede or facilitate team leaders’ adoption of the tool. This knowledge enables researchers to develop strategies that target barriers (e.g. education) and complement facilitators (MDS contains relevant content) to optimise clinician uptake of change. Theoretical frameworks help to streamline the implementation and evaluation process, thereby reducing the knowledge-translation gap. Study findings will inform strategies used to implement an electronic MDS for nursing team leader shift-to-shift handover.
ACKNOWLEDGEMENTS

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CONFLICT OF INTEREST

There are no conflicts of interest to declare.


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doi:10.1136/amiajnl-2010-000020
4.4.2  Phase 3, publication 4

The second part of Phase 3 utilised three steps from the KTA framework to implement and evaluate an eMDS for nursing TL handover. Informed by the findings in Part 1, implementation strategies were selected and utilised to introduce the eMDS into nursing TL handovers in the ICU. Three months post eMDS implementation, the eMDS was evaluated. A survey and audit were carried out to identify TLs’ use of the eMDS and TLs’ perceptions of eMDS use. These findings informed further modifications to the eMDS and handover process.

**Statement of contribution to co-authored published paper**

The fourth co-authored paper in this chapter was accepted for publication with the *Worldviews on Evidence-based Nursing Journal*. The details of the co-authored paper, including all authors, are:

My contribution to the paper involved:

- Critical review of the literature
- Conception and design of the study
- Participant enrolment
- Data collection
- Data cleaning and analysis
- Data interpretation
- Writing of the manuscript
- Revision of the manuscript for important intellectual content
- Approval of the final version

I completed the research and writing of the paper with methodological and editorial advice from my PhD supervisors Professor Wendy Chaboyer and Professor Leanne Aitken.
Student: Amy Janine Spooner

Co-author of the paper and supervisor: Professor Wendy Chaboyer

Co-author of the paper and supervisor: Professor Leanne Aitken
Descriptive title:
Implementation of an evidence-based practice nursing handover tool in intensive care using the knowledge-to-action framework.

Short title:
Implementation of an evidence-based practice nursing handover tool

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ABSTRACT

Background

Miscommunication during handover has been linked to adverse patient events and is an international patient safety priority. Despite the development of handover resources, standardised handover tools for nursing team leaders in intensive care are limited.

Aims

The study aim was to implement and evaluate an evidence-based electronic minimum dataset for nursing team leader shift-to-shift handover in the intensive care unit using the knowledge-to-action framework.

Methods

This study was conducted in a 21-bed medical/surgical intensive care unit in Queensland, Australia. Senior registered nurses involved in team leader handover were recruited. Three phases of the knowledge-to-action framework (select, tailor and implement interventions, monitor knowledge use and evaluate outcomes) guided the implementation and evaluation process. A post-implementation practice audit and survey were carried out to determine nursing team leader use and perceptions of the electronic minimum dataset three months after implementation. Results are presented using descriptive statistics (median, IQR, frequency and percentage).
Results

Overall (86%, n=49), team leaders used the electronic minimum dataset for handover and communication regarding patient plan increased. Key content items however were absent from handovers and additional documentation was required alongside the minimum dataset to conduct handover. Of the team leaders surveyed (n=35), those receiving handover perceived the electronic minimum dataset more positively than team leaders giving handover (n=35). Benefits to using the electronic minimum dataset included the patient content (48%), suitability for short-stay patients (16%), decreased time updating (12%) and printing the tool (12%). Almost half of the participants however, found the minimum dataset contained irrelevant information, reported difficulties navigating and locating relevant information and pertinent information was missing. Suggestions for improvement focused on modifications to the electronic handover interface.

Linking evidence to action

Prior to developing and implementing electronic handover tools, adequate infrastructure is required to support knowledge translation and ensure clinician and organisational needs are met.

Key words

Handover, minimum dataset, nursing, knowledge-to-action, evidence-based practice
INTRODUCTION

Until recently, there have been limited resources available to support nursing handover in the intensive care unit (ICU). Clinical handover is a top five preventable safety issue worldwide leading to adverse patient events and unnecessary healthcare expenditure (Starmer et al., 2013). Although research outlining various aspects of ICU handover is growing, there are limited standardised tools applicable to nursing team leader (TL) handover.

ICU nursing TLs oversee nurses at the bedside and are responsible for coordinating and managing care for multiple critically ill patients with complex healthcare needs. TLs rely on informative handovers to maintain care continuity following shift changes and play a pivotal role in ensuring ICU patients receive optimal care. Our previous work identified the content required in nursing TL handovers and informed the development of an electronic minimum dataset (eMDS) for shift-to-shift handover (Spooner et al., 2018c). Recently, electronic handover tools have received attention as a possible strategy to improve communication and reduce handover related incidents (Balka et al., 2013; Staggers et al., 2011). Many health care areas have developed electronic templates that auto-populate content from multiple sources within the clinical information system (CIS) or are updated manually by clinicians (typing in free text boxes); eliminating handover preparation time (Silvester & Carr, 2009). The introduction of electronic handover tools has increased efficiency, reduced time spent handwriting notes, decreased duration of handover, increased adherence to handover protocols and clinicians have reported finishing work on time (Balka et al., 2013; Li et al., 2013; Ryan et al., 2011).
The integration of evidenced-based strategies into practice, such as an eMDS for nursing TL handover can be challenging. Knowledge translation frameworks provide a structured and systematic approach to translate knowledge into practice, which promotes and sustains practice change (Davison et al., 2015; Field et al., 2014). The knowledge-to-action (KTA) framework is one of the most frequently cited conceptual frameworks used in healthcare settings to support researchers and clinicians implement evidence-base practice (Field et al., 2014). The framework incorporates existing change theories from health, social sciences, education and management fields to provide user-friendly action phases to consider during the knowledge translation process which was utilised in this research. Guided by the KTA, researchers and clinicians engage with end-users to identify gaps in practice, align new knowledge to the local context which informs implementation strategies to embed evidence-based practice (Field et al., 2014; Lockwood, Stephenson, Lizarondo, van Den Hoek, & Harrison, 2016). End-users act as informants throughout the implementation and evaluation process. The KTA comprises of two components: Knowledge Creation is the production of knowledge and consists of three phases – knowledge inquiry, knowledge synthesis and creation of knowledge for best practice (Graham, Tetroe, & KT Theories Research Group, 2007; Lockwood et al., 2016). The Action component guides the implementation process for change and sustainability consisting of seven phases - identify the problem; adapt knowledge to the local context; assess barriers to knowledge use; select, tailor and implement interventions; monitor knowledge use; evaluate outcomes; and sustain knowledge use.
Utilising the KTA framework, the study aim was to implement and evaluate an eMDS for ICU nursing TL shift-to-shift handover. This research sought to answer three questions:

1. What strategies should be used to implement an eMDS for handover?
2. To what extent did TLs use an eMDS for handover?
3. What were TL’s perceptions of an eMDS for handover?

METHODS

This study was conducted between January and June 2016 in a 21-bed adult medical/surgical ICU, specialising in cardiothoracic surgery at a tertiary referral hospital, in Queensland, Australia. Ethical approval was obtained by the institutional (HREC/10/QPCH/5) and university (NRS/09/13) Human Research Ethics Committee.

Setting

The ICU consists of three areas (ICU 1-cardiac surgical, 2 and 3–general); each area containing up to nine patients coordinated by one TL. There are 180 registered nurses employed in the ICU including 63 senior registered nurses working in TL roles. Handovers occurred at the nurses’ station within each area.
Participants

All nursing TLs were invited to participate. All TLs worked across the three ICU areas. Potential participants were told about the study at staff meetings. Written consent was obtained prior to study commencement and confirmed during data collection.

Electronic minimum dataset

An eMDS was built within the MetaVision (MDsoft®, 2017) CIS over a 6-month period (June-December 2015) in collaboration with the on-site CIS coordinator and Hospital Health Service information technology department. The eMDS was structured using the ISBAR (Identify-Situation-Background-Assessment-Recommendation) mnemonic and additional content items considered pertinent to ICU nursing TL handover, identified in previous research (Spooner et al., 2018c). Within the ‘Assessment’ category of the ISBAR mnemonic, TLs acknowledged and discussed significant detailed information within each body system (i.e., Respiratory system) to provide a thorough overview of the patient. For example, when TLs acknowledged the ‘social system’, information regarding family or care giver issues and needs were discussed. In addition to ISBAR, TLs mentioned alerts (allergies, infectious status, patient incidents) and patient management strategies (end-of-life plan, investigations). As TLs are also shift coordinators, they handed over managerial information regarding admissions, discharges, skill mix and theatre cases coming to ICU. An eMDS for each patient was generated and information was mostly auto-populated from multiple sources within the CIS. A free text box was provided with each eMDS to add additional information not included in the tool. Wi-Fi was
unavailable during the study period; therefore, smart devices were not used. Instead, an eMDS for each patient was printed from the CIS to facilitate bedside handover.

**Data collection**

The Action cycle from the KTA framework guided knowledge translation. Phase four, five and six informed the implementation and evaluation process for this research.

*Phase 4: Select, tailor, implement interventions*

Our previous work identified the barriers and facilitators to eMDS use (Spooner, Aitken, & Chaboyer, 2018a). Barriers consisted of knowledge deficits regarding the ICU handover work unit guideline and an eMDS that was not user friendly, time consuming and contained too much information. Facilitators included TL familiarity with most work unit guidelines and a user-friendly eMDS that saves time and contained relevant information. These findings informed four strategies selected to implement the eMDS into ICU. The investigators selected Interventions from recent systematic reviews and multiple strategies were utilised due to the cumulative and significant effect shown to promote practice change (Effective Practice and Organisation of Care, 2016; Grimshaw et al., 2012). First, 30-minute interactive education sessions were used to target knowledge deficits. A video focused on safety issues, the national handover standard, the ICU handover work unit guideline, handover resources and real-life handover scenarios to critique. TLs were also given hands on training
using the eMDS (Russell, Cornello, & Wright, 2007). Second, a small group of TLs and nursing management were recruited as ‘champions’ to be the driving force of change through developing positive relationships with nurses, challenging the barriers, educating and supporting TLs to use the eMDS (Effective Practice and Organisation of Care, 2016). Third, regular reminders regarding the eMDS were placed on posters at handover locations and sent via emails to increase nurses’ recall of handover knowledge and further embed the use of the tool (Effective Practice and Organisation of Care, 2016). Instructions and short reference guides were placed on computer desktops fastened to computer monitors to act as prompts. Fourth, ad hoc audit and feedback was used during the first four weeks of eMDS implementation. A clinical research nurse (AS) attended various handovers, seven days a week during night-to-day or day-to-night shift handover. Consistent with the feedback intervention theory, a behavioural change theory, TLs were given feedback regarding their use of the eMDS and goals were set to redirect their focus of attention during handover to promote behaviour change and efficient use of the eMDS (Kluger & DeNisi, 1996). The research nurse also assisted staff with troubleshooting issues and gained feedback about the eMDS which informed modifications to the tool electronic interface to ensure the eMDS was user friendly and efficient to navigate. This strategy relied on participant involvement to facilitate optimal use of the handover tool.

Phase 5: Monitor knowledge use

Three-months post eMDS implementation, 49 handovers were audited over 25 days (Monday-Friday) to determine the extent of TL use of the eMDS during
handover. A random number generator sampled one TL per handover from the three ICU areas during the night-to-day (0700-0730hrs) and day-to-night shift (1900-1930hrs) handover. Handovers were observed if the oncoming and outgoing nurse provided consent to participate and had not been previously observed handing over. Nurses were observed once giving handover and any number of times receiving handover. The audit tool contained three sections 1) demographics, 2) general handover information and 3) adherence to the ISBAR mnemonic and other key content items (Spooner et al., 2018c). The audit criteria were either met or not met.

The audit tool was scrutinised by an expert panel of six experienced nurses including two PhD supervisors, a Quality and Safety Clinical Nurse Consultant, Clinical Nurse, Clinical Nurse Teacher and Clinical Nurse Consultant in ICU for face validity. Next inter-rater reliability was established (≥ 80% agreement) between three auditors and then data collection commenced (Polit & Beck, 2012).

Phase six: Evaluation outcomes

A survey was distributed to all TLs (n=63) three months-post eMDS implementation to assess their perceptions of using the eMDS for handover. Surveys were placed on the ICU central desk along with an opaque envelope to collect completed surveys each day for three weeks. Email reminders were sent each week. The ‘Clinical Handover Staff Survey’ (O’Connell et al., 2008), widely used in handover research, was adapted to the ICU setting and consisted of four sections: 1) demographics, 2) TL perceptions of handover (25-items), 3) perceived strengths and limitations of handover and 4) suggestions for improvement. TLs were asked to rate their perceptions related to a series of
statements on a 7-point Likert scale ranging from ‘Strongly Disagree’ to ‘Strongly Agree’ and each item was given a score from 1 to 7. Nurses answered open ended questions relating to the strengths and limitations of the eMDS and made suggestions for improvement.

Although the survey tool has been previously assessed for face validity, the tool underwent further scrutiny by four expert nurses (two ICU nurses, a PhD student and PhD supervisor). During Phase 5 face validity (readability, understandability, relevance, ease of response) and content validity (clarity, consistency and content) were assessed using a 2-point scale with ‘Clear’ or ‘Unclear’/‘Yes’ or ‘No’ responses (Imle & Atwood, 1988). Although the initial content validity index was more than 0.8 (clarity:0.89, consistency:0.89 and content:1.0 Scale-Content Validity Index/Universal Agreement) questions were revised until perfect agreement was achieved (Polit & Beck, 2012). The survey tool was pilot tested at two different time points by eight TLs in the ICU to establish test-retest reliability (83% of nursing TLs had perfect agreement or 1-point difference in responses at two time points).

Data analysis

Descriptive statistics were used to summarise data from the post eMDS-implementation audit and survey. Data are presented as median, interquartile range, frequency and percentage. Responses to open ended questions and the frequency of recurring responses are summarised.
RESULTS

Phase 5: Monitor knowledge use

Three months following eMDS implementation 49 out of 63 (78%) TLs were observed performing handover (49 nurses giving handover, 49 nurses receiving handover) resulting in 322 patient handovers and a median of seven (IQR 3) patients discussed at each handover. Table 4.4.2.1 provides a summary of these observations. Participants were mostly female, and experienced ICU nurses. Slightly more than half of the handovers were observed from the night-to-day shift. Most handovers were performed using the eMDS to conduct handover, alongside other paper and electronic print-outs.
Table 4.4.2.1 Post-implementation observation participant characteristics

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Frequency</th>
<th>Median</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(n=49)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>35 (71)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>14 (29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursing grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse grade 6</td>
<td>23 (47)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nurse grade 5</td>
<td>26 (53)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years working</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years nursing</td>
<td>16</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Years working in ICU</td>
<td>13</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Years working as TL</td>
<td>6</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Shift</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Night-day</td>
<td>29 (59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day-night</td>
<td>20 (41)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handover time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handover time (mins)</td>
<td>29</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>Overtime (mins)</td>
<td>26 (53)</td>
<td>2</td>
<td>10</td>
</tr>
<tr>
<td>Handover started late</td>
<td>31 (65)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handover location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desk</td>
<td>4 (8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedside</td>
<td>40 (82)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing</td>
<td>5 (10)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Handover tools used during handover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>eMDS</td>
<td>42 (86)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body systems paper handover form</td>
<td>7 (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ward view (computer program)</td>
<td>11 (22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>9 (18)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Own notes</td>
<td>1 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical notes</td>
<td>1 (2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Audit findings are detailed in Table 4.4.2.2. Almost two thirds of TLs referred to *unit flow and management* (admissions, discharges, staffing, skill mix and equipment issues) of the ICU. Most TLs structured their handovers using the ISBAR mnemonic. Within the *Identify* category over three quarters of nurses referred to three patient identifiers to discuss patients, however only one patient’s medical identification number was mentioned in 322 patient handovers. More than half of the handovers contained information regarding patient diagnosis, reason for admission to ICU and surgical procedure however, only six percent of handovers contained information about resuscitation plans in the *Situation* category. Patient plan within the *Recommendations* category was the only item routinely discussed during handovers.
Table 4.4.2.2 TLs’ use of the electronic minimum dataset

<table>
<thead>
<tr>
<th>Category (n=49)</th>
<th>Subcategory</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit flow &amp; management</td>
<td>Mentioned in handover</td>
<td>31 (63)</td>
</tr>
<tr>
<td></td>
<td>Unit overview template</td>
<td>3 (6)</td>
</tr>
<tr>
<td></td>
<td>Equipment issues</td>
<td>10 (20)</td>
</tr>
<tr>
<td>Identify</td>
<td>Name</td>
<td>304 (94)</td>
</tr>
<tr>
<td></td>
<td>Age/date of birth</td>
<td>252 (78)</td>
</tr>
<tr>
<td></td>
<td>Days in intensive care</td>
<td>237 (74)</td>
</tr>
<tr>
<td></td>
<td>Medical identification number</td>
<td>2 (1)</td>
</tr>
<tr>
<td></td>
<td>Bed number</td>
<td>138 (43)</td>
</tr>
<tr>
<td></td>
<td>Admitting doctor</td>
<td>138 (43)</td>
</tr>
<tr>
<td>Situation</td>
<td>Diagnosis</td>
<td>186 (58)</td>
</tr>
<tr>
<td></td>
<td>Reason for admission to ICU</td>
<td>239 (74)</td>
</tr>
<tr>
<td></td>
<td>Surgical procedure (if applicable)</td>
<td>236 (73)</td>
</tr>
<tr>
<td></td>
<td>Acute resuscitation plan</td>
<td>18 (6)</td>
</tr>
<tr>
<td></td>
<td>Discharge status</td>
<td>85 (26)</td>
</tr>
<tr>
<td>Background</td>
<td>Medical/surgical history</td>
<td>262 (81)</td>
</tr>
<tr>
<td></td>
<td>Patient issues/status</td>
<td>263 (82)</td>
</tr>
<tr>
<td></td>
<td>Management of issues</td>
<td>252 (78)</td>
</tr>
<tr>
<td>Assessment</td>
<td>Central nervous system</td>
<td>75 (23)</td>
</tr>
<tr>
<td></td>
<td>aAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>283 (88)</td>
</tr>
<tr>
<td></td>
<td>Respiratory system</td>
<td>67 (21)</td>
</tr>
<tr>
<td></td>
<td>bAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>295 (92)</td>
</tr>
<tr>
<td></td>
<td>Cardiovascular system</td>
<td>81 (25)</td>
</tr>
<tr>
<td></td>
<td>bAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>289 (90)</td>
</tr>
<tr>
<td></td>
<td>Gastrointestinal system</td>
<td>24 (7)</td>
</tr>
<tr>
<td></td>
<td>bAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>201 (62)</td>
</tr>
<tr>
<td></td>
<td>Renal system</td>
<td>19 (6)</td>
</tr>
<tr>
<td></td>
<td>bAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>252 (78)</td>
</tr>
<tr>
<td></td>
<td>Skin system</td>
<td>27 (8)</td>
</tr>
<tr>
<td></td>
<td>bAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>98 (30)</td>
</tr>
<tr>
<td></td>
<td>Social system</td>
<td>6 (2)</td>
</tr>
<tr>
<td></td>
<td>bAcknowledged</td>
<td></td>
</tr>
<tr>
<td></td>
<td>bObservations</td>
<td>88 (27)</td>
</tr>
<tr>
<td>Recommendation</td>
<td>Patient plan</td>
<td>232 (72)</td>
</tr>
<tr>
<td></td>
<td>Chores for next shift</td>
<td>69 (21)</td>
</tr>
<tr>
<td></td>
<td>Consultations</td>
<td>36 (11)</td>
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<tr>
<td>Other</td>
<td>Alerts</td>
<td>82 (25)</td>
</tr>
<tr>
<td></td>
<td>Additional patient updates</td>
<td>56 (17)</td>
</tr>
</tbody>
</table>

*aAcknowledged - stated the body system before discussing observations

*bObservations - discussed observations relating to the corresponding body system
Phase six: Evaluation outcomes

Three months following eMDS implementation 35 (56%) nursing TLs completed a survey assessing their perceptions of the eMDS (Table 4.4.2.3). Most respondents were female and had extensive ICU experience.

Table 4.4.2.3 Post-implementation survey respondent characteristics

<table>
<thead>
<tr>
<th>Demographics (n=35)</th>
<th>Frequency (%)</th>
<th>Median</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>5 (14)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>24 (69)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤25</td>
<td>1 (3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26-35</td>
<td>13 (37)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36-45</td>
<td>8 (23)</td>
<td></td>
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</tr>
<tr>
<td>46-55</td>
<td>10 (29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;55</td>
<td>1 (3)</td>
<td></td>
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</tr>
<tr>
<td>Nursing grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 5 Registered nurse</td>
<td>23 (66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grade 6 Clinical nurse</td>
<td>8 (23)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Work status</td>
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<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>15 (43)</td>
<td>34hrs/week</td>
<td>6</td>
</tr>
<tr>
<td>Part-time</td>
<td>19 (54)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of years nursing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤5</td>
<td>2 (6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6-10</td>
<td>8 (24)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11-20</td>
<td>10 (29)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥21</td>
<td>11 (31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years working in ICU</td>
<td></td>
<td>13</td>
<td>7</td>
</tr>
<tr>
<td>Year working as TL</td>
<td></td>
<td>8</td>
<td>5</td>
</tr>
</tbody>
</table>

Although all TLs giving handover carried out bedside handover (100%, n=35) and used the eMDS (74%, n=26), enabling them to share the upcoming patient plan and give advice to oncoming TLs, they did not consider handovers were succinct or the forum to include patients or families. TLs receiving handover
generally perceived handover positively reporting that they felt comfortable asking questions, information was up to date, timely and contained sufficient content (Table 4.4.2.4).

Table 4.4.2.4 *TL perceptions*' of an electronic minimum dataset for handover

<table>
<thead>
<tr>
<th>Question (n=35)</th>
<th>Median</th>
<th>IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TL receiving handover</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am able to ask questions about information that has been provided to me at handover</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>I am provided with sufficient information about patients at handover</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>The format in which information is provided to me at handover is easy to follow</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>The information that I receive is up to date</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>I am able to remain focused at handover</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>I am informed about different aspects of nursing care during handover</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>Patient information at handover is provided in a timely fashion</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>I feel that important information is not always given to me at handover</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>I am given information during handover that is not relevant to patient care</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>I can obtain the handover information from the patients’ electronic record instead of using the TL handover tool</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>I find it beneficial to visualise the patient during handover</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>The information that I receive at handover is ambiguous?</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>The new handover tool extends the time needed for handover</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td><strong>TL giving handover</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The new handover tool helps me to deliver a succinct handover</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>I feel comfortable handing over confidential information at the bedside</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>I use strategies to appropriately discuss sensitive information at handover</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>I am often interrupted by colleagues, patients &amp;/or their significant others during handover</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>I have the opportunity to debrief with other colleagues at handover when I have a difficult shift</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>I have the opportunity to discuss how patient issues were managed during the shift</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>I have the opportunity to discuss workload issues at handover</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>I share the upcoming plans for patient care during handover</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>I give advice to the oncoming TL during handover</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>I invite patients to participate in the handover process</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>I invite family members to participate in the handover process</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>There is enough time for me to deliver handover</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

1=Strongly disagree, 2=Disagree, 3=Somewhat disagree, 4=Neither agree/disagree, 5=Somewhat agree, 6=Agree, 7=Strongly agree
TLs described advantages and disadvantages to using the eMDS and suggested improvements. Responses provided three or more times by TLs are reported. Seventy-one percent (n=35) of respondents surveyed described the advantages to be content (48%), suitability for short-term patients (16%), saves time (12%) and easy to print (12%).

Thirty (86%) respondents surveyed recalled disadvantages to using the eMDS. Almost half of the participants found the tool contained irrelevant information (e.g., number of times dialysis stopped and started), reported difficulties navigating and locating relevant information and missing content because items had not been auto-populated into the tool. In addition, TLs found the eMDS time consuming (37%), difficult to print (23%), the eMDS relied on medical notes that were often not documented and missing and six (20%) nurses continued to write their handover notes.

Although several strategies were recommended, the most common related to the lay out of the eMDS (24%), using the body systems to structure the tool (14%), incorporating the typed weekly medical summary (14%) and reporting trends in data such as vital signs rather than a snapshot at one point in time (14%).

DISCUSSION

Our study examined the implementation and evaluation of an evidence-based eMDS for ICU nursing TL shift-to-shift handover using the KTA framework. Participants were experienced ICU nurses. Multiple implementation strategies (education, champions, reminders, ad hoc audit and feedback) were employed
to overcome the barriers and complement the facilitators identified in previous literature. Three-months post implementation most TLs used the eMDS to conduct handover however key content items were absent and additional documentation was used alongside the eMDS. Nurses receiving handover had more positive perceptions of the eMDS than nurses giving handover and open-ended questions revealed numerous disadvantages relating to the electronic capability of the tool and suggestions for improvement were aimed at modifying the handover interface.

Alongside identified deficiencies with the electronic handover interface, the KTA framework lacked sufficient guidance to troubleshoot issues that arose during the implementation and evaluation process. The KTA is widely used in knowledge translation and is not only a process model (provides steps in the process of translating research into practice), it is also a determinant framework (identifies the barriers and facilitators to implementation outcomes) that provides an implementation process that proceeds in a step-wise linear fashion (Nilsen, 2015). The implementation process however, is a multifaceted and complex phenomenon and the KTA has been criticised for being too generic, providing limited support during the implementation process.

Although some improvements were seen in nursing TL handover, our findings indicate that there were multiple shortcomings with the implementation of an eMDS in the ICU. In addition to using the KTA to structure the project, strategies informed by other theoretical approaches may have provided the researchers with additional support to resolve unanticipated problems, thereby optimising the knowledge translation process. The incorporation of strategies based on behavioural theories such as the COM-B (Capability, Opportunity,
Motivation and Behaviour) which focuses on altering components of the behaviour system to promote change (Michie, van Stralen, & West, 2011) or the Transformation theory whereby clinicians learn how their experiences, perceptions and values lead to subsequent actions by using critical reflection and discourse (Matthew-Maich, Ploeg, Jack, & Dobbins, 2010) may have been a beneficial adjunct. Addressing emotions, attitudes and beliefs toward an intervention may have motivated nurses to embrace and sustain a new handover procedure.

Despite limitations of the KTA, several factors relating to the CIS may have also contributed to inadequate communication of content items during TL handover. For instance, most TLs printed additional documentation to accompany the printed eMDS as important information was absent either because medical staff had not updated the electronic record (e.g. admission notes) or because the CIS was unable to integrate information (x-ray and magnetic resonance imaging results) from external sources. A survey conducted by the Healthcare Information and Management Systems Society reported that more than 90% of hospitals used six or more types of medical devices/databases and approximately a third integrated them with one another or the electronic medical record (Healthcare information and management systems society, 2010). Furthermore, nurses were forced to print the eMDS for each patient as Wi-Fi was unavailable to accommodate portable devices. Nurses reported delays of up to two hours to upload and print eMDSs. Similar findings were identified in an examination of the use of an electronic handover tool to improve doctors’ weekend patient handovers (Govier & Medcalf, 2012).
Several benefits of incorporating information technology into handovers have been described however, our findings were not consistent with the literature.

**LINKING EVIDENCE TO ACTION**

- Researchers and clinicians should consider using an overarching theoretical framework such as the KTA to embed knowledge into practice as it articulates a systematic approach.
- When implementing new practices, those leading the change should draw on multiples theories to challenge engrained attitudes and behaviours and to troubleshoot unanticipated issues which may assist to embed evidence-based practice into clinical settings.
- Prior to introducing evidence-based practices, healthcare settings need to ensure adequate infrastructure is in place to support and optimise the knowledge translation process.
- While paperless teams are the way of the future, managers and directors need to ensure that clinical information systems meet user needs, fulfil safety and quality standards and optimise patient care.

Although the content of the eMDS was based on an earlier phase of this work, the CIS was not able to accommodate some items into the handover interface such as trends in vital signs and specific therapies the patient received. Instead, the eMDS contained a snapshot of vital signs at one point in time and contained all therapies the patient received including unnecessary details such as the number of times a dialysis machine was stopped and started. Consequently, TLs navigated through pages of information to locate pertinent items to discuss. A major limitation of current ICU CIS is the inability to perform basic analyses (e.g., report trends in vital signs) and future CIS will need to be able to synthesize and translate data into meaningful, actionable information (De Georgia et al., 2015). The eMDS did not include patient and family educational needs as this was conveyed by the bedside nurse. TLs discussed educational needs if related to managerial issues.
Recommendations for practice

Several key considerations for the development of electronic handover tools within CISs were identified in this study. Despite close collaboration between the researchers and CIS coordinator to resolve issues with the handover interface, the infrastructure was inadequate to support the establishment of a handover tool that could meet end-user needs. Vendor support was critical to resolving the technological issues however would have required additional funding that was not attainable or feasible for this research study. Similar issues were highlighted in Saleem et al’s study (2015) that evaluated commercial CIS for ICUs. The investigators suggested that efficient technical support is needed to positively support the application’s reliability and end-user satisfaction (Saleem et al., 2015). Purchasing regional CIS that contain local or on-site technological support may provide ongoing and timely assistance rather than enterprise level CISs, where support is provided off-site, is either delayed or unavailable and frequently expensive to obtain.

When purchasing a CIS, organisations need to ensure that the system can integrate data from multiple sources, the architecture facilitates complex data mining and analysis (to make sense of patient data), incorporates a user friendly, visual display and an interface that will promote informed decisions about patient care and the delivery of quality care to patients (De Georgia et al., 2015). When developing and implementing electronic handover tools it is vital to work with a skilled information technology team to build a flexible interface that can be modified to accommodate user needs and meet national and local standards.
Limitations of the study

The study was conducted in one ICU therefore the results may not be generalizable but may be used to inform the development of electronic handover tools in other ICUs, especially given Australian ICUs are posited for widespread use of MetaVision. It is possible nurses may have changed their behaviour during observational audits of handover but several observations of nursing handovers have been conducted previously in the ICU for research and hospital-wide auditing and the investigators believe that nurses appeared comfortable being observed.

CONCLUSION

Our research examined the implementation and evaluation of an eMDS for nursing TL handover in the ICU. The KTA framework provided a structure to implement and evaluate an evidence-based eMDS for nursing TL shift-to-shift handover. The incorporation of theories to challenge engrained attitudes and behaviours may assist researchers and clinicians with embedding evidence into clinical settings such as the ICU. While interest in eMDSs is gaining momentum in healthcare facilities, adequate infrastructure is required prior to developing electronic interfaces in healthcare settings. Electronic handover interfaces need to be flexible, modifiable, easy to navigate, contain content that promotes succinct and informative handovers of ICU patients to maintain continuity of care and improved patient outcomes.
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doi:10.1186/1748-5908-7-50


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4.4.3 Phase 3, publication 5

In Phase 1, interruptions occurred frequently prior to implementing the eMDS and relocating handover from the ICU desk space to the bedside. The final paper focuses on the frequency, source and reasons interruptions occurred before and after the implementation of the eMDS and other handover improvement strategies. The findings shed light on interruptions that occur during nursing TL handover in the ICU, an area which has not been previously investigated. This paper sets the scene for further research in this area.

Statement of contribution to co-authored published paper

The fifth co-authored paper in this chapter was accepted for publication with the Journal of Nursing Care Quality. The details of the co-authored paper, including all authors, are:

My contribution to the paper involved:

- Critical review of the literature
- Conception and design of the study
- Participant enrolment
- Data collection
- Data cleaning and analysis
- Data interpretation
- Writing of the manuscript
- Revision of the manuscript for important intellectual content
- Approval of the final version

I completed the research and writing of the paper with methodological and editorial advice from my PhD supervisors Professor Wendy Chaboyer and Professor Leanne Aitken.
19/07/2018

___________________________________________ Date ____________

Student: Amy Janine Spooner

20/07/2018

___________________________________________ Date ____________

Co-author of the paper and supervisor: Professor Wendy Chaboyer

19/07/2018

___________________________________________ Date ____________

Co-author of the paper and supervisor: Professor Leanne Aitken
Interruptions during senior nurse handover in the intensive care unit: a quality improvement study

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Menzies Health Institute Queensland, Gold Coast, Queensland, Australia (Wendy Chaboyer and Leanne Aitken);
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Funding statement

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Conflicts of interest

There are no conflicts of interest to declare.
ABSTRACT

Background

Interruptions during handover may compromise continuity of care and patient safety.

Local Problem

Interruptions occur frequently during handovers.

Methods

A quality improvement study was undertaken to improve nursing team leader handover processes in one intensive care unit. The frequency, source, and reason interruptions occurred were recorded before and after a handover intervention.

Interventions

The intervention involved relocating handover from the desk to bedside and using a printed version of an evidence-based electronic minimum dataset. These strategies were supported by education, champions, reminders, audit and feedback.
Results

Forty handovers were audiotaped before, and 49 were observed 3 months following the intervention. Sixty-four interruptions occurred before and 52 after the intervention, but this difference was not statistically significant. Team leaders were frequently interrupted by nurses discussing personal or work-specific matters before and after the intervention.

Conclusions

Further work is required to reduce interruptions that do not benefit patient care.

Key words

Bedside Handoff, Handover, Intensive Care Unit, Interruptions, Quality Improvement
INTRODUCTION

Clinical handover (handoff) occurs frequently in health care facilities each day to ensure continuity of care despite multiple shift and staffing changes. Since the World Health Organization (WHO) listed clinical handover as one of the top five priority areas for patient safety improvement (World Health Organization, 2007), much work has been carried out to improve communication during handover and reduce interruptions and subsequent adverse patient events. This large body of research has led to several advancements in clinical handover. Some of these advancements include the use of verbal, face-to-face handovers in place of written or audiotaped handovers (Smeulers, Lucas, & Vermeulen, 2014; Vergales, Addison, Vendittelli, Nicholson, Carver, Stemland et al., 2015), relocation of handovers from office spaces or meeting rooms to the patient bedside (Bradley & Mott, 2014; Mardis et al., 2016), the use of evidenced-based or universally recognised handover mnemonics (Natafgi et al., 2017; Starmer, O’Toole, Rosenbluth, Calaman, Balmer, West et al., 2014) and minimum datasets to structure handover (Johnson, Jefferies, & Nicholls, 2012). There has also been a growing interest in the use of electronic tools to hand over patient information (Anderson et al., 2015b; Payne, Stein, Leong, & Dressler, 2012). An area that continues to fuel debate relates to interruptions and whether they enhance or impede clinicians’ ability to deliver informative, accurate and timely handovers (McCurdie et al., 2017b; Sasangohar et al., 2015a).

While interruptions have been linked to error and even patient harm in some cases (Feil, 2013), other studies have shown that resident doctors physicians were resilient to distractions during handovers (Anderson et al., 2015a; Tapia, Fallon, Brandt, Scott, & Suliburk, 2013). Anderson and colleagues proposed that
handovers were impervious to interruptions and residents had either developed increased automatization of the handover process (from experience, with fewer cognitive resources required to complete the primary task) or a global ability to maintain focus, thereby developing tolerance to distractions (Anderson et al., 2015a). Consequently, the elimination of interruptions during handover was not considered a high priority during surgical residents’ handovers (Anderson et al., 2015a). Further research is required to understand which interruptions are potentially harmful or advantageous to handovers and their association with patient outcomes.

Review of the literature

Interruptions occur when there is a break in performance of a human activity initiated by an internal or external source (Brixey et al., 2010; Westbrook et al., 2010). Handovers in health care facilities are frequently interrupted which has the potential to lead to the loss of critical patient information or hinder task completion (Rivera-Rodriguez & Karsh, 2010). While large scale studies have detected associations between interruptions and communication deficiencies compromising patient safety, the evidence for a direct causal connection between interruptions and undesirable outcomes is not strong (McCurdie et al., 2017a). Furthermore, the factors that make undesirable outcomes more likely or less likely are difficult to identify (Walter, Dunsmuir, & Westbrook, 2015). A greater awareness of the assumptions and inconsistencies in previous work will assist clinicians, quality improvers and researchers to conduct research to close the current gaps in knowledge (Walter et al., 2015).
Health care settings such as the intensive care unit (ICU) are chaotic, demanding, time constrained and patient needs can change with little warning. Research to date has focused on the influence of interruptions on medication administration (Thomas, Donohue-Porter, & Stein Fishbein, 2017), workflow (Weigl, Muller, Zupanc, Glaser, & Angerer, 2011), cognition (Rivera-Rodriguez & Karsh, 2010), and task completion (Rivera-Rodriguez & Karsh, 2010), but only one study was found that examined interruptions during nursing handover in the ICU (Spooner et al., 2015). Furthermore, no research relating to nursing team leader (TL) handover was identified. Team Leaders are responsible for the care of multiple ICU patients. Team Leaders oversee care provided by bedside nurses and liaise with members of the multidisciplinary team to coordinate the daily running of the ICU. It is important that handovers between oncoming and outgoing TLs are accurate, informative and timely to maintain continuity and quality of care.

Specific aims

A before and after quality improvement (QI) study was undertaken with the aim to improve the handover process and reduce interruptions.

METHODS

Setting

This QI study was conducted in a 21-bed (government funded) adult medical/surgical ICU, specialising in cardiothoracic surgery at a tertiary referral hospital, in Queensland, Australia. There are 180 registered nurses (RN)
employed in the ICU including 63 senior RNs working in TL roles. The ICU consists of three areas (ICU 1 - cardiac surgical, ICU 2 and 3 – general); each area containing up to nine beds coordinated by one TL. Prior to the handover improvement strategy, nursing TLs conducted handover at the central ICU desk and discussed up to nine patients at change of shift. Ethical approval was obtained by the institutional (HREC/10/QPCH/5) and university (NRS/09/13) Human Research Ethics Committee for the conduct of the study.

Participants

Senior ICU RNs involved in TL handover were recruited. Potential participants were told about the study at staff meetings and participant information sheets and consent forms were sent via internal mail to all nursing staff who met the inclusion criteria (Senior ICU RNs involved in TL handover). Written consent was obtained prior to study commencement and consent was confirmed verbally at the time of data collection.

Improvement Intervention

During previous research studies examining handover practices at this site, TLs voiced their frustrations with the frequency of interruptions and dissatisfaction with current handover practices. Therefore a team was assembled to better understand the current process to determine opportunities for improvement. To align with the Australian National Safety and Quality Health Service Standard on clinical handover and improve nursing TL handover processes, a handover
improvement strategy was introduced between January and March 2016. Components of the handover strategy included 1) relocating TL handover from the central ICU desk space to the patient bedside and 2) TLs using an evidence-based structured electronic minimum dataset (eMDS) that was printed from a clinical information system (CIS) to facilitate walk around bedside handover and to provide TLs with a prompt if they were interrupted. The content of the eMDS was determined in a previous study (Spooner et al., 2018c) and was structured using the ISBAR (Identify-Situation-Background-Assessment-Recommendation) mnemonic. It also included additional items considered important by TLs to include in handover such as unit flow and management (admissions, discharges, staffing etc), patient alerts (infectious status, site of infection) and patient updates (End of life plan). Most content in the eMDS was auto-populated from multiple sources within the CIS (nursing and medical notes, observations, medications), dramatically reducing TL handover preparation time. The eMDS was printed just prior to handover and contained the most up to date patient information. This is the first time the eMDS was implemented for use in an ICU.

To implement the handover strategy, education sessions were carried out with all TLs. Education included techniques to minimise personal or work-specific interruptions (e.g., outgoing floats/access nurses intercepting and troubleshooting non-urgent interruptions that could be relayed to the oncoming TL at the completion of handover), increase nurses’ awareness around interruptions (e.g., only interrupting handovers if critical to patient care), nurses critically discussed handover scenarios and were given hands on training using the eMDS. Nurse champions were appointed to assist with education and implementation of the eMDS. Reminders were used to update nurses about
handover changes and a research nurse audited adhoc handovers to provide nurses with feedback on their use of the eMDS. Interruptions were assessed before and after the handover intervention was implemented, to establish current practice and to evaluate any change associated with the handover intervention.

**Data Collection**

Before and after implementation of the handover intervention, the frequency, source and reason interruptions occurred (Spooner et al., 2015) were examined. Prior to implementation 40 TL handovers (40 TLs giving handover, 40 TLs receiving handover) were audiotaped at the central ICU desk, during May-June 2011. To minimise the Hawthorne effect the research nurse positioned the audio recorder on the desk where handover occurred and the TL pressed record once handover commenced. Three months after the handover intervention had been implemented, 49 TL handovers (49 TLs giving handover and 49 TLs receiving handover) were observed during April-June 2016. As TLs were unable to carry the audio recorder as well as handover notes during bedside handover, data collectors attended walk around bedside handovers with the oncoming and outgoing nursing TLs to collect the data.

To reduce the chance of bias, a random number generator was used to randomly sample 1 TL handover from the 3 areas within ICU during the night to day (1900-0730hrs) and the day to night shift (0700-1930hrs) handover between Monday and Friday. Handovers were audiotaped or observed if the oncoming and outgoing nurses both provided consent to participate and had not been previously recorded or observed handing over. If the TL did not provide consent
or had been studied previously, the next randomly selected pair were approached and studied. Nurses were recorded or observed once giving handover and any number of times receiving handover. An interruption was defined as any sound or conversation that caused the handover to stop momentarily (Brixey et al., 2010; Westbrook et al., 2010). An audit tool was developed and included the frequency, source and reason for the interruption (Spooner et al., 2015) which was tallied from transcribed audio recordings or observed handovers. Demographic data collected included ICU area, gender, nursing level and hours worked of the outgoing TL handing over. The audit tool was scrutinised by an expert panel of six experienced nurses including 2 PhD prepared Nurse Researchers, a Quality and Safety Clinical Nurse Consultant, Clinical Nurse, Clinical Nurse Teacher and Clinical Nurse Consultant in ICU for face validity. There was 1 consistent observer that reviewed and categorised audio recordings and observed handovers in both phases of data collection. Audio recordings from audits carried out prior to implementation of the handover intervention were categorised by 1 Nurse Researcher and further scrutinised by 2 senior researchers. Following the handover intervention, 10 handovers were observed and audited by 3 nurses and answers were compared for agreement. Inter-rater reliability was established at ≥ 0.8 between all observers before data collection commenced.

**Analysis**

Descriptive statistics were used to summarise data from transcribed audio recordings and observed handovers. Interruptions were categorised into patient-
specific (interruptions that convey information relevant to overall patient safety) or personal and work-specific interruptions (interruptions with personal content or work-related content e.g., tasks not related to the patient) (Myers et al., 2016; Sasangohar et al., 2015a). Data are presented as median, interquartile range, frequency and percentages. A t-test was performed to identify any differences in interruptions before and after the intervention.

RESULTS

Before implementation of the handover improvement strategy

A total of 277 patient handovers were recorded at the central ICU desk, and included 64 interruptions or the equivalent to one interruption every 23 minutes or every fourth patient. Thirty (75%) of 40 TL handovers observed were interrupted (Table 4.4.3.1). Registered nurses (50/64, 78%), medical staff (5/64, 8%) and phone calls (4/64, 6%) were the main sources of interruptions (Table 4.4.3.1). Other sources to interrupt handover occurred two times or less (e.g., alarms, administration officer, patient buzzer, bedside emergency). The main reasons interruptions occurred were to discuss personal or work-specific content such as: greetings exchanged between nurses and the TL (e.g., thanking the TL for a good shift/asking permission to go home/saying goodbye); organisational discussions (admissions/discharges/sick calls) and personal conversations with minimal patient-specific interruptions such as patient updates (e.g., change in patient’s management plan or health status during handover) (Table 4.4.3.2).
Table 4.4.3.1 Frequency of interruptions during Team Leader handovers at the ICU desk and bedside

<table>
<thead>
<tr>
<th></th>
<th>ICU desk handover (n=40)</th>
<th>Bedside handover (n=49)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Median</td>
</tr>
<tr>
<td>Handover time (mins)</td>
<td>896</td>
<td>23</td>
</tr>
<tr>
<td>Number of patients</td>
<td>277</td>
<td>7</td>
</tr>
<tr>
<td>Number of interruptions</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>Handovers interrupted</td>
<td>30 (75)</td>
<td></td>
</tr>
</tbody>
</table>

Table 4.4.3.2 Reasons nursing Team Leader handovers were interrupted

<table>
<thead>
<tr>
<th></th>
<th>Desk handover (n=64)</th>
<th>Bedside handover (n=52)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal or work specific interruptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greetings (Thank you, goodbye, permission to leave)</td>
<td>22 (34)*</td>
<td>21 (40)*</td>
</tr>
<tr>
<td>Organisational (Staffing, admissions)</td>
<td>16 (25)*</td>
<td>6 (12)*</td>
</tr>
<tr>
<td>Personal discussions</td>
<td>7 (11)*</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Trolley (Kitchen, linen and stock trollies)</td>
<td>0</td>
<td>5 (10)*</td>
</tr>
<tr>
<td>Inquiries/assistance required</td>
<td>4 (6)</td>
<td>1 (2)</td>
</tr>
<tr>
<td>Patient specific interruptions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Patient update</td>
<td>7 (11)*</td>
<td>5 (10)*</td>
</tr>
<tr>
<td>Emergency (MET call/patient arresting in ICU)</td>
<td>2 (3)</td>
<td>2 (4)</td>
</tr>
<tr>
<td>Investigations/results</td>
<td>1 (2)</td>
<td>3 (6)</td>
</tr>
</tbody>
</table>

*Top four reasons handover was interrupted

After implementation of the handover improvement strategy

A total of 322 patient handovers were observed at the bedside, and included 52 interruptions or the equivalent to one interruption every 29 minutes or every sixth patient. Twenty-eight (58%) of 49 TL handovers were interrupted (Table 1). Similar to handovers pre-implementation, nurses (36/52, 57%) and phone calls...
(3/52, 6%) were the main source to interrupt handovers. However, other sources included wards people (orderlies) (5/52, 10%) and kitchen staff (4/52, 8%). Other sources to interrupt handover occurred three times or less (e.g., medical staff, alarms, administration officer and patient). While interruptions containing personal or work specific content, such as greetings exchanged between nurses and the TL (e.g., thanking the TL for a good shift/asking permission to go home/saying goodbye) and organisational discussions (admissions/discharges/sick leave calls) were common in both groups, other interruptions included linen and food carts wheeled through the handover group. There were also minimal interruptions containing patient-specific content such as patient updates (e.g., change in patient’s management plan or health status during handover) (Table 4.4.3.2). While fewer interruptions occurred following the handover intervention, the difference in the frequency of interruptions between groups was not statistically significant (p-value=0.08).

**DISCUSSION**

This study compared the frequency, source and reasons interruptions occurred during nursing TL handover, both before and after the implementation of a handover intervention. Although there was a trend towards fewer interruptions after the handover intervention, the difference in frequency of interruptions was not statically significant. While most interruptions were initiated by nurses greeting the TL in both groups, interruptions varied between locations. Also, most interruptions before and after the handover intervention related to personal or work-specific content (greetings, personal discussions and
organisational), potentially contributing to miscommunication during handover and compromising patient safety.

The last decade has seen major changes to handover processes to improve communication and reduce adverse patient events. One of these initiatives is to relocate handovers from office and desk spaces to the bedside (Bradley & Mott, 2014; Jeffs et al., 2013). Unlike handovers conducted away from the bedside, bedside handovers allow nurses to visualise patients, conduct safety scans and prompts questions (Chaboyer et al., 2009). These changes have been associated with improved patient care and improved patient outcomes such as a reduction in medication errors, falls and skin tears (Bradley & Mott, 2012; Mardis et al., 2016). This study also showed that bedside handovers were associated with a trend towards fewer interruptions from clinicians, which may have been attributed to clinicians perceiving bedside handover as more official than handover at the desk and were less likely to interrupt handovers.

Along with a trend towards fewer interruptions following the handover improvement strategy, interruptions remained frequent. Sasangohar and colleagues identified that clinicians attempting to interrupt a nurse will regulate their interruptions based on the tasks being performed by the nurse (Sasangohar et al., 2015b). For instance, a light-emitting diode (LED) erected on top of the ICU room door, illuminated with the words “do not disturb” during high-risk tasks (e.g., medication administration, infusion set up, a procedure etc), showed a significant reduction in interruptions demonstrating that clinicians will delay nonurgent interruptions until a more suitable time (Sasangohar et al., 2015a). Perhaps the frequency of interruptions in our study could be attributed to the interrupter’s lack of information or understanding of the importance or level of risk associated with
handover. Interventions such as LED lighting informing clinicians not to interrupt handovers, may assist to reduce interruptions containing personal or work-specific content during nursing TL handover (Sasangohar et al., 2015a).

Alongside the frequency of interruptions, our findings indicate that the source and reasons interruptions occurred varied between locations. For instance, desk handovers attracted more interruptions from nursing and medical staff, while bedside handovers were interrupted by equipment such as kitchen and linen carts being wheeled through the middle of the handover group. Although bedside, face-to-face handovers are considered the most effective and safe approaches to carrying out high quality handovers (Chaboyer et al., 2009), the findings indicate positioning of the handover group during bedside handover should be considered to avoid work-specific interruptions and to also minimise the impact of bedside handover on other clinicians. A study examining nursing bedside handovers in the ward environment found that the geographical layout of some wards was not conducive to bedside handover without environmental changes to reduce local noise (Johnson & Cowin, 2013). Further work is required to understand and promote an environment that optimises bedside handover.

While interruptions are common, their effect on handover quality is uncertain (Feil, 2013). Several researchers have recommended categorising interruptions into patient-specific (positive, critical, necessary) and work-specific (nonurgent, waste, unnecessary) or personal to understand the frequency and impact of distractions in health care settings as an alternative to labelling all interruptions negatively (Myers et al., 2016; Rivera, 2014; Sasangohar et al., 2015a). Although interruptions were frequent in one study conducted in a cardiovascular ICU, most interruptions experienced by nurses were positive and conveyed information
about the patient or other work-related information indirectly affecting the patient (Sasangohar et al., 2015b). This study however, showed that personal or work-specific interruptions (greetings, organisational updates, personal discussions) outweighed patient-specific interruptions (patient updates, emergencies, test results) during nursing TL handover. Myers and colleagues suggest interruptions that provide value to patients should be supported through process improvements and those detrimental to patients should be targeted by continuous improvement efforts (Myers et al., 2016). Personal or work-specific interruptions may be challenging to reduce or eliminate due to policies, organisational and culturally embedded clinical practices however efforts to eliminate these distractions may be critical to ensuring nursing TLs provide informative, quality and timely handovers (Myers et al., 2016).

**Implications for practice**

This study demonstrated that a strategy to improve handover was associated with a trend towards fewer interruptions and variations between locations in the source and reason interruptions occurred. Also, most interruptions in both locations were personal or work-specific such as greetings exchanged with TLs. There are several strategies that can be introduced to minimise interruptions during handover. These include education about patient safety, incorporating an alert system that informs staff that an important task is underway and interruptions are not recommended and to utilise other nurses such as outgoing float/access nurses or bedside nurses that have finished handover, to intercept and manage interruptions during handover (Craig, Clanton, & Demeter, 2013; Sasangohar et al., 2015a).
Other strategies can be employed to reduce the impact of interruptions during handover. These include using a written or printed document or portable device containing structured handover information to accompany handover so that clinicians can revisit their notes if they are distracted, minimising memory loss and omission of critical information due to the interruption (Myers et al., 2016; Rivera-Rodriguez & Karsh, 2010; Thomas et al., 2017). McCurdie et al recommends education programs and quality improvement projects should focus on building resilience amongst nurses to buffer unsafe consequences of interruptions (McCurdie et al., 2017b). These strategies may benefit inexperienced clinicians that have had minimal exposure to busy clinical settings, to effectively manage interruptions and the delivery of high quality handovers.

Further work is needed to develop and test strategies to minimise interruptions that contain personal or work-specific content and to translate these strategies into practice. Conducting education sessions with nursing management, TLs and bedside nurses to reduce unnecessary interruptions appears warranted. During nursing TL bedside handover, TLs may consider a quick walk around the ICU bedside to greet staff prior to commencing handover, ensure the handover group is positioned away from the path of linen and kitchen carts accessing ICU areas and from bedside nurses conducting handovers. Also, as each health care setting is unique, interruptions will differ between settings. Interruption classification, along with the environment of the setting need to be considered to effectively reduce or manage the impact of interruptions in handover locations such as the ICU.
Limitations

The study was conducted in one ICU and contained a small sample size, therefore the results may not be generalizable but this ICU is typical of many Australian ICUs, with TLs overseeing the care of many patients, and specific handover times. Consequently, the data are likely to be reflective of many Australian ICUs and the findings provide a beginning to understand interruptions in this context. Also, nurses may have changed their behaviour during observational audits of handover. The quality and safety team however, conduct audits routinely in the unit and staff are used to being observed in practice. Although task completion during handovers was not examined, most nursing TLs used written or pre-printed handover notes that they could refer to reducing the likelihood of omitting information following an interruption. Furthermore, assessing the lag time to resume handover following an interruption may have provided insight into whether nurses compensated for the delay, if they were able to resume their task, if handover times changed and the quality of information delivered at handover. (Grundgeiger, Sanderson, MacDougall, & Venkatesh, 2010) As the handover intervention contained several elements, it is difficult to establish whether reductions in the frequency of interruptions during bedside handover were associated with the implementation strategy such as education sessions or the handover intervention such as the change in location from the desk to bedside or the use of a structured handover tool. Also, other factors occurring within the setting at the time of the study may have influenced the findings such as the busyness of the ICU, staffing levels and acuity of patients.
CONCLUSION

This QI study identified that interruptions during TL handover were frequent and were often personal or work-specific in nature. Relocating handover to the bedside, along with using a standardised eMDS to handover critical patient information that can be referred to following interruptions, may have the potential to reduce communication failures during handover but requires further investigation. Further measures are needed to reduce interruptions containing personal or work-specific content and to build resilience amongst nurses to manage the impact of interruptions during clinical handovers.
REFERENCES


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4.5 Summary

The content of nursing TL handover in the ICU, which has not previously been investigated, was identified in Phase 1. The findings indicated that the handovers lacked structure, were conducted away from the bedside, the content was variable and key requirements of the NSQHSS – Clinical Handover, were not being satisfied. These findings identified a need for further research to improve communication during nursing TL handover to improve patient safety and reduce unnecessary adverse events.

In Phase 2, nursing TLs identified the content required in an eMDS for ICU handover. Team Leaders recognised that a standardised framework such as the ISBAR schema was necessary however, they also identified additional items not covered in the ISBAR schema, specific to ICU that were important to include in handovers. Additionally, TLs acknowledged that each ICU patient has a different disease process and different health needs, therefore TLs recommended content items to include in all handovers and content items to include in handovers only when relevant to the patient.

The eMDS that was developed for ICU nursing TL shift-to-shift handover in the early phases of the study was implemented and evaluated in the final phase (Phase 3) of the study. Part 1 findings indicated that the barriers and facilitators to TL use of the eMDS were influenced by the knowledge, usability, relevance of information and the efficiency of the eMDS. These findings informed further modifications to the eMDS and implementation strategies selected to introduce the eMDS into TL handovers. In Part 2, audits of TL handovers revealed that most TLs used the eMDS and relocated their handovers to the bedside. Furthermore, there were some improvements in the
content included in handovers, while there were other content items that did not improve or were minimally discussed at handover. There were no statistical differences in the frequency of interruptions post eMDS implementation, and nurses greeting TLs continued to be the main reason handovers were interrupted. Post-implementation nurses identified several limitations of the eMDS, and suggested further modifications were needed to meet user needs. Recommendations for future work in this area included the incorporation of relevant theories to challenge engrained beliefs and behaviours to promote uptake of change in healthcare settings, and the need for adequate infrastructure to be in place to support the development and use of electronic interfaces in healthcare settings. While each paper discussed the findings reported in it, the last chapter of this thesis provides a discussion about the research as a whole.
Chapter 5: Discussion and conclusion

5.1 Introduction

In the past decade there has been a growing evidence-base in handover to improve communication practices; however, there are limited resources specific to nursing shift-to-shift handover in the ICU setting. This is the first study conducted in an ICU setting to examine nursing TL handover. Prior to conducting this research, nursing TL handover in the study site did not align with the Australian NSQHSS – Clinical Handover (Recently revised to Communicating for safety in version 2). The aspects of the standard not met included identifying training requirements for effective and coordinated clinical communication; monitoring, implementing and reporting on the effectiveness and outcomes of clinical communication processes; and organisational processes such as structured handover tools that contain the minimum information required to handover critical patient information. In addition to adding new knowledge to the field, this research aligned nursing TL handover practices with the Australian NSQHSS – Clinical Handover, to meet accreditation requirements and thereby optimising patient safety.

The previous chapter presented the findings from a three-phase interventional study, detailed in five publications. Because each paper includes a detailed discussion of specific findings, in this chapter, a broader approach to discussing the findings as a whole in relation to three major themes is taken. These include: 1) the influence of human factors on handover; 2) the use of conceptual frameworks and theories to guide knowledge translation; and 3) the significance of end-user involvement and integration of evidence-based strategies into clinical practice. But prior to this discussion an overview of the 3 phases and five papers is given. Recommendations for practice,
education and future research are also discussed, and the strengths and limitations of the entire program of research are considered.

In Phase 1, key content of nursing TL handovers was identified (Spooner et al., 2016). Some items within the ISBAR schema were frequently discussed by TLs handing over information such as patient identifiers, while other items contained much variability (Assessment) or were less frequently discussed (Recommendations). Phase 1 results indicated that TLs identified several content items that were not captured by the ISBAR schema, such as unit flow and management, alerts, administrative tasks and patient management, and that there was much variability in the content discussed.

In Phase 2, TLs reviewed Phase 1 findings and determined essential content to include in an eMDS for handover (Spooner et al., 2018c). While TLs agreed that the ISBAR schema was useful to structure information, they suggested that each patient had different disease processes, requiring specialised care and individualised information to be handed over. Therefore, while some items within each category were relevant to all handovers (patient identifiers), additional content was included if relevant to the patient (e.g. include oxygen saturation if the patient was weaning from ventilation or had respiratory complications). Similarly, content that did not fit into the ISBAR schema was categorised in the same way.

Phase 3 results were multi-dimensional and are presented in three publications (Spooner et al., 2018a; Spooner et al., 2018c; Spooner, Chaboyer, & Aitken, in press). First, the barriers and facilitators to the implementation of an eMDS for nursing TL handover in ICU were identified. The barriers and facilitators focused on usability, efficiency and content included in the eMDS, which informed the implementation
phase of the study. Next, the eMDS was implemented and evaluated in ICU, and the strengths and weaknesses of the eMDS were identified. While some improvements in handover practices were seen, limitations of the electronic interface reduced the usability and efficiency of the tool, and TLs suggested further modifications to the eMDS were needed. Last, the frequency and source of interruptions were examined before and after the implementation of the eMDS alongside a handover improvement strategy (handover relocated to the bedside and education relating to the reduction of unnecessary interruptions during handover). In both pre- and post-implementation groups, nurses were the main source of interruption during TL handovers, greeting TLs as they were arriving or leaving the ICU. A summary of each publication within each phase of the study is summarised in Table 3.
### Table 3 Summary of papers published in peer reviewed journals

<table>
<thead>
<tr>
<th>Phase</th>
<th>Title</th>
<th>Methods</th>
<th>Main findings</th>
<th>New contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nursing TL handover in the ICU contains diverse and inconsistent content: An observational study (Spooner et al., 2016).</td>
<td>TL handovers were audiotaped over 20 days, during all shifts, Monday-Friday. Deductive and inductive content analysis determined the frequency of content discussed. Results were presented using descriptive statistics.</td>
<td>Forty nursing TLs were audiotaped resulting in 277 patient handovers. Within the ISBAR schema TLs frequently discussed content within Identify (99%), Situation (96%) and Background (88%); however, Assessment (69%) content was variable and patient Recommendations (60%) was minimally discussed. Non-ISBAR content included unit flow and management, alerts, administrative tasks and patient management.</td>
<td>Content of TL handovers, was identified – this had not previously been known. Handover content was variable and aspects did not meet the national standard. Some content items relevant to ICU handover were not captured in the ISBAR schema.</td>
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<td>2</td>
<td>Developing a MDS for nursing TL handover in the ICU: A focus group study (Spooner et al., 2018c).</td>
<td>TLs, representing a variety of nursing grades attended 90-minute focus group sessions, using an NGT. Participant responses were summarised as frequencies.</td>
<td>Seventeen TLs participated in three focus groups. Participants agreed that ISBAR was a useful tool to guide clinical handover. TLs confirmed handover content required within ISBAR and additional content specific to the ICU. Other content items if relevant to the patient were recommended.</td>
<td>Patient conditions vary therefore, while some handover items are consistent, others vary between handovers based on relevance to patients.</td>
</tr>
<tr>
<td>3</td>
<td>Barriers and facilitators to the implementation of an evidence-based eMDS: A descriptive survey (Spooner et al., 2018a).</td>
<td>An established survey tool was modified to the handover context and distributed to all TLs (n=63) working in ICU to assess barriers and facilitators to eMDS use. Descriptive statistics were used to summarise results.</td>
<td>Thirty-nine (62%) TLs completed the survey. TLs used a variety of methods to handover. Factors identified as impeding TL use of the eMDS were that the tool was not user friendly, it was time consuming and contained too much information. Facilitators to eMDS use were that the tool was user friendly, saved time and contained relevant information.</td>
<td>Barriers and facilitators to eMDS use focused on usability, content and efficiency of the eMDS. These findings highlighted user needs and informed implementation strategies used to introduce the eMDS.</td>
</tr>
<tr>
<td>Phase</td>
<td>Title</td>
<td>Methods</td>
<td>Main findings</td>
<td>New contributions</td>
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<tr>
<td><strong>3</strong></td>
<td>Implementation of an evidence-based practice nursing handover tool in ICU using the KTA framework (Spooner, Aitken, &amp; Chaboyer, 2018b).</td>
<td>KTA phases (select, tailor and implement interventions, monitor knowledge use and evaluate outcomes) guided eMDS implementation and evaluation. Three months post-implementation an audit and survey were undertaken to determine TL use and perceptions of the eMDS. Results were presented using descriptive statistics. Responses to open-ended questions and frequency of recurring responses were summarised.</td>
<td>TLs used the eMDS and relocated to the bedside to conduct handover. Some key content items were discussed frequently while others showed no improvement or were absent from handovers. Additional documentation was required alongside the eMDS to conduct handover. Benefits of the eMDS were: patient content and time saved updating the tool. Disadvantages of the eMDS were: irrelevant content included, difficulties navigating and locating relevant information, and pertinent content was missing. Nurses suggested eMDS modifications were required.</td>
<td>The development of an eMDS that meets user needs and, relies on adequate infrastructure in place to support their use in healthcare settings.</td>
</tr>
<tr>
<td></td>
<td>Intermittions during senior nurse handover in ICU: a QI study (Spooner et al., in press).</td>
<td>Frequency, source and reasons for interruptions occurring before and after a handover strategy (eMDS, handover relocated to bedside) were recorded. Descriptive statistics were used.</td>
<td>Interruptions were frequent during nursing TL handovers, before and after implementation of the handover strategy. Nurses were the main source of interruptions during handovers greeting TLs.</td>
<td>TL handovers are commonly interrupted by personal (nonwork-related conversations) or work-specific (sick calls) interruptions that add no value to handovers.</td>
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</table>

**eMDS** – electronic minimum dataset, **ISBAR** – Identify-Situation-Background-Assessment-Recommendation, **ICU** – Intensive care unit, **KTA** – Knowledge-to-Action framework, **NGT** – nominal group technique, **QI** – Quality improvement, **TL** – Team Leader
5.2 The influence of human factors on handover

The following section discusses human factors such as cognitive overload, cognitive bias and safety culture and how they relate to study findings. For example, cognitive overload could explain why TLs missed reporting some information during handover in Phase 1. In Phase 1 TL handovers were frequently interrupted and lacked standardised content, and multiple forms (e.g. handover forms, test results, notes) and screens (vital signs, medications) within the CIS were used to handover patients. In addition, handovers were located at the ICU desk, instead of the bedside, preventing TLs from visualising patient needs, performing rapid assessments, prioritising care and rectifying or clarifying inconsistent information (Anderson et al., 2015b). The combination of these factors also increased TL cognitive load which may have resulted in cognitive overload, thereby compromising patient safety.

Cognitive overload can be frequently experienced by nurses in settings such as ICU, where TLs oversee the care of multiple critically ill patients. Cognitive overload occurs when the cognitive load of a learner’s working memory capacity is exceeded, leading to miscommunication, content errors and adverse events. Nurses are constantly multitasking, prioritising care, making decisions and being interrupted, making them highly susceptible to cognitive overload (Doerhoff & Garrison, 2015). Fatigue is also common among nursing staff due to working long shifts (12-hours), shift work and sleep deprivation, which can have a significant impact on mental state and the ability to perform (Doerhoff & Garrison, 2015). When cognitive load exceeds an individual’s capacity to take in more information, errors or omissions of information can occur, compromising patient care (Potter, Wolf, Boxerman, Grayson, Sledge, Dunagan et al., 2005; Reason, 2000).
Communication failures are the leading contributor of adverse patient events worldwide (Joint Commission Center for Transforming Healthcare, 2012). Adverse events are commonly perceived as failures of individuals and/or organisations, with a view that modifying the behaviour of the individual or group through retraining will prevent the incident from reoccurring (Dekker, 2014; Karsh, Weinger, Abbott, & Wears, 2010). While organisations may find it easier to redirect the blame of adverse events to individuals, this strategy is unlikely to promote safer healthcare environments (Reason, 2000). The study of human factors is a growing field of interest in healthcare due to its potential in reducing adverse patient events and improving patient safety. The study of human factors involves understanding the behaviour of individuals, their interactions with each other and their environment (National Quality Board & NHS England, 2013). Thus, human factors may help to explain some of the study findings.

When developing and implementing practice improvement strategies into healthcare settings, it is important to consider human factors that may facilitate or impede uptake of the strategy. For instance, nurses’ clinical practices vary depending on their level of experience; interaction with equipment, colleagues and environments; and how they process information. Furthermore, the clinical environment is complex, multifactorial, unstable and difficult to control, presenting challenges for maintaining a safe practice environment (Quinn, 2016). The study of human factors in the healthcare context considers human strengths and limitations in the design of interactive systems for people, equipment, and environments, rather than adapting human behaviour to suit systems. (Henriksen, Dayton, Keyes, Carayon, & Hughes, 2008).

This research considered human factors such as cognitive overload caused by elements including workload, fatigue, interruptions and reliance on memory to improve
handover communication in the ICU setting. In Phase 2, TLs were engaged in focus groups to identify handover content for inclusion in an eMDS. Phase 2 findings informed the development of a standardised eMDS which included the ISBAR schema and ICU specific content, creating a common language among TLs. To reduce the time spent updating the eMDS prior to handover and to reduce errors associated with manually writing or typing handover notes, most content in the eMDS was auto-populated from multiple sources within the CIS (nursing and medical notes, observations, medications). A printed version of the eMDS was also available as a prompt to reduce reliance on memory, while carrying out bedside handover. These strategies contributed to the reduction of TL cognitive load while multitasking.

While some handover improvements were seen, the research revealed that other aspects of handover were difficult to change. This may have been due to human factors such as cognitive bias. Cognitive bias occurs when humans have a limited ability to process new information. It is affected by contextual factors, information structures, embedded attitudes, mood, and preferences to maintain the status quo (Leventhal & Scherer, 1987; Seshia, Makhinson, & Young, 2014). Decision making is based on previous experience or learned behaviours, and often lacks detailed analytical reasoning (Molony, 2016). Tversky and Kahnemann’s research (1974) identified three main heuristic methods that can result in bias and a failure to solve problems effectively, potentially causing patient harm (Tversky & Kahneman, 1974). These methods are: representativeness (judgements based on how representative or similar they are to stereotypes); availability (judgement on how often an event occurs is based on how readily available they can remember a similar event); and adjustment and anchoring (judgement or decision formed by the first numbers or data seen, rather
than considering all information equally). Although there are several heuristics to consider, the three noted above occur automatically. They are mental shortcuts our mind uses to make decisions in complex environments with incomplete information that can lead to errors.

Elements of cognitive bias were demonstrated in Phase 3. For example, despite targeted implementation strategies (education, reminders, champions, ad hoc audit and feedback) prior to eMDS implementation, critical content was minimally discussed or absent from handovers post eMDS implementation. Furthermore, TLs acknowledged that while an eMDS would help to standardise content and improve handover practices, they were hesitant to trial an eMDS. It was the researcher’s assessment that TLs’ cognitive bias or preconceived beliefs that the handover intervention was unnecessary may have impeded TLs’ ability to completely change their handover practices. Further work is required to test this hypothesis and to understand the impacts of cognitive bias on knowledge translation in healthcare settings.

Anecdotal findings from the study suggested that TLs may not have appreciated the importance of safety culture in providing quality care. This was exemplified prior to eMDS implementation where approximately half of all participants had not read the ICU clinical handover work unit guideline. This may indicate a lack of knowledge regarding evidence-based handover practices and a lack of consideration for the risks associated with not reading the work unit guideline. Also, despite education relating to the key requirements of the NSQHSS – Clinical Handover to improve handover practices and patient safety, TLs continued to exclude patients and families from
handovers conducted at the bedside. To include patients and families would have required a major shift in attitudes and behaviours.

Safety culture has been linked to both staff and patient safety and reflects managerial and staff attitudes and values toward the management of risk and safety (World Health Organization, 2009). Safety culture can influence what is considered normal staff behaviour in a particular area in relation to taking risks, following rules, and reporting errors and incidents (World Health Organization, 2009). The safety culture of a specific area such as ICU relies heavily on effective leadership (from TLs to nursing management) to achieve a safe work environment that optimises patient outcomes (Jeffs et al., 2013). Therefore, if the safety culture surrounding handover is not valued, efforts to improve communication during handover may be limited. Further work to explore safety culture from the micro (individual), meso (team) and macro (organisation) levels would assist researchers to understand the specific needs of healthcare settings, at various levels, for building a safety culture and promoting practice change.

While complex systems such as healthcare are not immune to adverse events, it is crucial that robust systems are developed to withstand human and operational hazards, rather than systems focused solely on isolated hazards (Reason, 2000). Further research is required to better understand the impact of human factors in the healthcare setting, including how humans interact with tools and equipment in the workplace (Fryer, 2012; Institute of Medicine, 2000; Redley & Waugh, 2018). This information can be used to design evidence-based strategies such as an eMDS that supports users’ strengths and limitations and improves communication during handover.
5.3 The use of conceptual frameworks and theories to guide knowledge translation

In the past, there has been little guidance to support researchers, clinicians and managers with the implementation of evidence-based practices into clinical settings. New knowledge has commonly been introduced to clinical settings using strategies based on past experiences, with little justification for how implementation methods work (Brehaut & Eva, 2012). Although theory-guided research is not new (Alligood, 2011), the use of conceptual frameworks to guide knowledge translation in healthcare settings is underutilised, despite being a critical component for embedding change in healthcare settings (Bond, Eshah, Bani-Khaled, Hamad, Habashneh, Kataua et al., 2011; Curtis, Fry, Shaban, & Considine, 2017). Knowledge translation strategies that are underpinned by conceptual frameworks and theories, strengthen integration of change (Field et al., 2014). In the following section, the advantages and limitations of the KTA framework to guide this interventional study are discussed.

The present study utilised the KTA framework to guide the implementation and evaluation of an eMDS for nursing TL handover in ICU. The KTA framework is one of the most frequently cited knowledge translation frameworks in healthcare (Nilsen, 2015). Other conceptual frameworks have been scrutinised for being too rigid, stifling creativity and innovation, and for neglecting interactions and relationships between individuals in the study setting (Rycroft-Malone, 2007). In contrast, the KTA incorporates the setting context using broad concepts that can be applied in multiple environments and targeting multiple themes. The framework is also practical and flexible, providing a systematic structure and rationale for activities to approach during the knowledge translation process (Field et al., 2014; Graham & Tetroe, 2010). The
KTA framework consists of steps within the Knowledge Creation and Action Cycle. Steps within the Action Cycle can occur sequentially or simultaneously depending on the needs of the clinical setting. The framework enables researchers to immerse themselves in the study setting, understand the needs of the user, and to adapt knowledge translation strategies to user needs.

Through the application of Action Cycle steps to this study, an understanding of the ICU environment was gained. This allowed for engagement with TLs and the implementation of an eMDS that targeted TL handover needs specific to ICU. While TLs were hesitant to trial the eMDS, study findings indicated that post implementation, TLs adopted the eMDS to conduct handover. It also found that they relocated handover from the central ICU desk to the bedside. These changes to handover practices led to communication and process improvements, potentially reducing avoidable adverse patient events associated with miscommunication (Spooner et al., 2018b).

Researchers have proposed adopting overarching knowledge translation frameworks like the KTA framework and integrating relevant theories into specific steps of the framework to understand and tailor translation strategies to the healthcare setting (Brehaut & Eva, 2012; Bunkers, 2013; Quinn, 2016; Rycroft-Malone, 2007). While the KTA framework was based on a synthesis of 31 action theories, the framework has been criticised for not prescribing specific theories to utilise and direct action for each step of the framework (Graham & Tetroe, 2010). Upon reflection, the incorporation of theories relating to human, social and organisational factors when investigating the barriers and facilitators to eMDS use may have offered the potential to develop a more in-depth understanding of the setting. These theories may have
informed further modifications to the eMDS, and resulted in a more targeted implementation strategy, potentially increasing TL uptake of the eMDS.

For example, the Theoretical Domains Framework (TDF) was developed to investigate the behaviour of health professionals in the field of implementation in clinical settings (Francis, O’Connor, & Curran, 2012). The TDF consists of 33 factors that have been synthesised into 12 domains, providing a theoretical lens to view cognitive, affective, social and environmental influences on behaviour. Users are provided with a systematic process to select suitable constructs for their settings (Michie, Johnston, Abraham, Lawton, Parker, & Walker, 2005; Phillips, Marshall, Chaves, Jankelowitz, Lin, Loy et al., 2015). Application of the TDF to this study may have been beneficial to understand nurses’ beliefs and behaviour toward change and to inform strategies to mediate behaviour change.

Introducing changes to clinical practice can trigger intense feelings in individuals. Unchallenged attitudes and beliefs are frequently cited as a barrier to knowledge translation and are often overlooked in knowledge translation frameworks (Davis, 2006; Matthew-Maich et al., 2010; Ploeg, Davies, Edwards, Gifford, & Miller, 2007). These specific barriers were not identified in step three of the Action Cycle: assess barriers and facilitators to knowledge use in this study (Spooner et al., 2018a). Utilising constructs from behavioural theories such as the TDF and Transformation Theory (Matthew-Maich et al., 2010) may have assisted the researchers to understand nurses’ attitudes and beliefs toward the eMDS, and informed strategies to challenge or facilitate these attitudes prior to eMDS implementation. It would have also assisted in explaining why improvements were seen in the communication of some content items and not others.
Originally developed by Mezirow (1978), Transformation Theory has undergone several iterations and extensive theoretical and empirical testing over the past three decades (Freire, 2005; Habermans, 1987; Mezirow, 1978; Taylor, 2007). The theory critically reflects on how personal assumptions, attitudes and beliefs influence individual actions. The transformative process assists individuals to better understand how their experiences and views lead to certain behaviours or actions. This process highlights the importance of reflecting on beliefs and emotions, to understand an individual’s decision-making process. This method enables nurses to value and embrace new learning approaches and, as a result, may have further enhanced TL uptake of the eMDS in this study (Matthew-Maich et al., 2010).

Other limitations of the KTA framework include its two-dimensionality and linear representation (Graham & Tetroe, 2010). Although there were many benefits to using the KTA framework to implement handover changes within the nursing TL cohort, the research did not extend to other nursing levels (e.g. Clinical Nurse Consultants, Nurse Unit Managers, Nursing Director) or the multidisciplinary team (medical team, allied health) within the setting. While there is no apparent difficulty in applying this framework to multiple levels of an organisation, the focus of knowledge translation strategies should be redesigned to target the specific needs of other levels, rather than just the group changing their practice. In addition, the incorporation of multiple theories within an overarching conceptual framework, such as the KTA, and the application of theoretical frameworks that target micro (individual), meso (team) and macro (organisation) levels of a given context may be beneficial to embedding change throughout an organisation.
McWilliama and colleagues (2008) piloted a knowledge translation intervention using social interaction theories that target the three levels (micro, meso and macro) of the setting. Their study showed that each level contained separate barriers and facilitators, and that shared decision making from all groups ensured successful implementation of change strategies. The investigators also acknowledged this process to be challenging. Additional research is needed to understand the application of the KTA framework at each level of the organisation (TLs, managers and directors). This may be beneficial to building a safety culture, and challenging cognitive biases toward the implementation of changes to handover practices, reducing miscommunication failures, and to improve patient safety.

Another potential strategy to support the implementation process is to employ multiple facilitators with specialised skill sets to target different aspects of the knowledge translation process. This includes external facilitators, with expertise in facilitation to support internal facilitators with skills in handover content and other leaders driving change within the organisation. These facilitators are equipped to manage the different levels and layers of complexity within healthcare settings, to manipulate contextual factors and support the learning of individuals and teams to adopt new knowledge (Kitson & Harvey, 2016). An external person, not known to the organisation, free from bias, or attachment to the intervention, and with skills to provide appropriate training for the context may have been beneficial in this study. While this technique may have added to the rigour of the implementation process, these services also attract significant costs. When selecting a conceptual framework and strategies for implementing new practices, researchers, clinicians and managers need to carefully select the most appropriate strategies for the context but must also consider
the resources and financial costs for effectively embedding new knowledge into practice.

5.4 End-user involvement and integration of evidence-based strategies into clinical practice

Knowledge translation involves the interchange between knowledge (the most up to date and evidence-based practices) and the users (clinicians), to optimise patient care, minimise harm to patients and improve health outcomes for patients. While knowledge translation is a critical component for ensuring patients receive a high standard of care, if the new knowledge is not practical for specific healthcare settings or relevant to the users, the knowledge translation process is ineffective (Cornelissen, Mitton, & Sheps, 2011). By understanding the practice setting, a clinician’s practice and culture facilitates integration of evidence-based practice throughout the healthcare setting. Furthermore, engaging end-users in the knowledge translation process is considered critical to the adoption and sustainability of practice change in healthcare settings (Hadji & Degoulet, 2016; Yusof, 2015). Involving stakeholders in the initial planning stages and throughout the implementation and evaluation process ensures user needs are met. Stakeholder engagement also maximises efficacy of the practice change and user uptake of the change (Hadji & Degoulet, 2016). This section provides a critical discussion of the end-user engagement techniques used in the study to promote practice change and handover improvements.

End-user engagement techniques were used throughout this study. In Phase 2 Tls identified content to be included in an MDS for nursing TL handover to inform the development of an eMDS that met TL handover needs. In Phase 3 barriers and
facilitators (from a user perspective) to eMDS use were identified, and used to inform the development of an electronic interface for the eMDS prior to implementation. Despite end-user involvement, a post-implementation survey of nurses’ perceptions described several challenges in the functionality of the electronic interface which may have influenced nurses’ satisfaction levels and compromised its continued use in handover. Involving TLs in the testing of the electronic interface prior to implementation in the ICU may have further informed modifications to the eMDS enhancing usability and satisfaction levels with its use.

Testing the electronic interface of the MDS prior to implementation in ICU may have been facilitated through clinical simulation. Clinical simulation employs real users enacting realistic clinical work scenarios in close to real-life environments. This technique enables new initiatives to be tested in a controlled environment where there is no risk to patients (Jensen & Kushniruk, 2016). Jensen and Kushniruk’s (2016) case study used clinical simulation to test the design of electronic documentation templates and reports for nurses. Using those techniques, divergences between nurses reshaped relations, and shifted alliances and overall balance of power through the inclusion of stakeholders from all levels (Jensen & Kushniruk, 2016). Involving TLs in testing the eMDS prior to implementation in the ICU, may have assisted researchers to identify items that needed further consideration prior to implementation in the ICU (Takian, Sheikh, & Barber, 2012).

Furthermore, the utilisation of theoretical frameworks relating to technological based interventions such as the Technology Acceptance Model (TAM) and Information Systems Success Model (ISSM), may have provided guidance for integrating the eMDS into TL handover (Davis, 1989; DeLone & McLean, 2003; Hadji & Degoulet,
Davis developed the TAM to measure nurses’ behavioural intent and actual use of healthcare clinical information systems (CIS) to understand users’ technological acceptance and satisfaction with using CIS (Davis, 1989). The ISSM theory was verified for use in evaluating technological capability in relation to the information processing requirements of healthcare organisations (DeLone & McLean, 2003). These theories provide a more holistic perspective of human-computer interactions. Through applying these principles, studies have shown that alignment between end-users’ needs and the technological functionality of information processing can facilitate optimal performance of individuals and organisations (Hadji & Degoulet, 2016; Kowitlawakul, 2011). Incorporating constructs from these theories in the study may have helped to overcome the electronic interface issues, thereby providing TLs with a more user-friendly handover tool.

This study demonstrates the complexity of knowledge translation. Despite using a structured conceptual framework and well described strategies to implement and evaluate the eMDS, the study was impeded by a range of individual, social and environmental factors. This was further exacerbated by the challenges of developing an eMDS within a CIS that was not able to incorporate all user needs (Lin, 2017; Smith, Lacey, Williams, Teasley, Olney, Hunt et al., 2011). Although benefits to eMDS use were identified in our research, the functionality of the CIS interface limited its ability to effectively replace the paper handover forms used previously. A study examining nurses’ satisfaction using a nursing information system showed that when nurses felt that the systems aligned with their needs, their perspective of usefulness and satisfaction with the information system was higher and their quality of work improved (Lin, 2017). In turn, if users did not believe that the CIS supported their practice or
improved patient care, successful adoption was difficult (Smith et al., 2011). Further work is required to streamline the development and integration of electronic interfaces within CIS to ensure they can be manipulated to meet the needs of the users and the healthcare settings. Also, further resources are required to examine the sustainability of electronic interfaces over time.

5.5 Strengths and limitations

There are several strengths to this research which has and will continue to inform handover practices. First, this three-phase interventional study engaged TLs in the development of an eMDS for nursing TL handover. End-user involvement increased the likelihood the practice will be both feasible and sustainable. Second, this is the first evidence-based eMDS generated for nursing TL handover in the ICU that aligns with national standards. Thus, it contributes to the hospital’s accreditation. Third, the study was underpinned by a conceptual framework (KTA) for practice change, which helped determine the scope (breadth and depth) of the research. Although some aspects of handover did not improve, this research provides researchers, clinicians and quality improvers with recommendations to consider when establishing new practices into clinical settings such as ICU. Through an understanding of the complexities and unpredictability of the healthcare environment, human factors and the limitations of CIS, knowledge translators can devise strategies to overcome these obstacles and further streamline the knowledge translation process.

Limitations of this research need to be considered. First, research was conducted in one ICU, with a small sample size that may restrict generalisability of the findings to other ICU settings. Second, the design for observation in Phase 1 and 3 may have
lent itself to the Hawthorne effect, whereby nurses may have changed their behaviour during observational audits and audio recordings. The nurses however, appeared comfortable with being observed, which may be due to regular auditing conducted in the ICU. Third, this research focused solely on nursing TLs and did not engage staff from the meso and macro levels of the organisation which may have further enhanced uptake of the eMDS embedding its use in handover. Fourth, research findings highlighted limitations of the ICU CIS, which hindered nursing TLs satisfaction and uptake of the eMDS. This was further exacerbated by the vendor’s lack of engagement, support for researchers and users and the vendor’s willingness to revise and modify the CIS to optimise handover and patient safety. Finally, the research was not resourced for the significant costs required to collaborate with the vendor, to engage with all levels of the organisation or to utilise expert facilitators in knowledge translation. These resources would have assisted in improving the implementation process and providing an examination of the sustainability of eMDS use over time. A more detailed analysis of the limitations to this research were described in each of the five publications.

5.6 Recommendations

Several recommendations relating to education, nursing practice and research can be drawn from this study to inform further improvements to handover practices in the ICU.
This research used a range of educational strategies to support the incorporation of the new handover process. For example, education sessions commenced with an overview of handover, patient safety, requirements of the national standard and hospital procedures. Next, TLs were asked to critique real-life TL handovers to develop problem solving skills and to identify features that constituted effective and ineffective handovers. Finally, TLs were shown the eMDS and given a demonstration of its use in handover. All education sessions were carried out in small interactive and participatory education sessions. These strategies specifically targeted the barriers and facilitators to knowledge use identified in Phase 3 and facilitated the translation of new knowledge into nursing TL handover practice (Laugaland, Aase, & Barach, 2012; Stoyanov, Boshuizen, Groene, van der Klink, Kicken, Drachsler et al., 2012).

There are however, additional strategies that may have further enhanced nursing TL knowledge in handover. These include simulation, the incorporation of handover education focused on disease aetiologies, and the commencement of handover education upon employment in the ICU. Simulation that involves clinician role playing in simulated clinical scenarios has been shown to improve communication among health professionals (Hsu, Chang, & Hsieh, 2015; Toghian Chaharsoughi et al., 2014). Simulation enables clinicians to repeatedly test their skills and learn from errors in a safe, risk-free environment (Berkenstadt, Haviv, Tuval, Shemesh, Megrill, Perry et al., 2008). Yu and colleagues (2017) also found that nursing students who received instructional education, combined with simulation showed greater improvement in handover communication than those receiving instructional education alone. In this research, simulation would have enabled researchers to engage with nurses to test
the eMDS in a safe environment prior to implementation, and to inform additional modifications to the eMDS. Furthermore, nursing TLs would have received hands on training using the eMDS which may have assisted with embedding new changes into handover and, as a result, improving communication competence (Yu & Kang, 2017).

The differing experience levels (e.g. years of nursing, post-graduate education) of outgoing and oncoming TLs is another issue to consider when delivering education to clinicians. While the eMDS may be useful for providing objective patient data and important information regarding the patient’s plan of care, TLs will interpret and convey this information differently, during a handover. Young et al. found that when cognitive levels of oncoming and outgoing clinicians surpassed working memory, the accuracy of the shared mental model was threatened and learning degraded (Young, van Dijk, O’Sullivan, Custers, Irby, & Ten Cate, 2016). The incorporation of education focused on disease aetiologies, diagnoses and treatment may be useful to reducing the imbalance of knowledge and experience amongst nurses (Young et al., 2016). To sustain further improvements in TL handover communication in the ICU, the integration of regular teaching sessions using case studies to discuss the diagnosis, treatment and management of ICU patients, may assist in building TL confidence in their understanding of disease aetiologies, and the way to convey this information, when giving or receiving handover.

Until recently, undergraduate programs have not prepared nurses or other clinicians with effective skills to communicate in situations such as handover; instead it is a skill learnt in the clinical setting through the observation of peers (Lee, Mast, Humbert, Bagnardi, & Richards, 2016; O’Toole, Stevenson, Good, Guiot, Solan, Tse et al., 2013). While the education strategies and recommendations from this research
may improve TLs’ communication practices in the ICU, this learning should commence in undergraduate programs and upon employment in clinical settings. Through starting this process early, effective communication practices can develop over time, resulting in advanced communication skills and patients receiving a high standard of care that is harm free.

5.6.2 Practice

This study highlighted the lack of structure and variability in nursing TL handovers in the ICU. Introducing a standardised handover tool provided structure and a common language among TLs to communicate critical patient information during handover. All practice settings should have a structured handover process in place to help nurses communicate competently during handover, to reduce inconsistencies and optimise patient safety.

There are many factors to consider when implementing new practices into clinical settings. Some of these factors include the setting (i.e. the ICU), the users and the team of experts facilitating changes to practice. It is important however, that clinicians, researchers and quality improvers recognise that clinical settings are chaotic, unpredictable environments that are difficult to control. The KTA framework guided the implementation and evaluation of an eMDS for nursing TL handover in the ICU, which led to improvements with the content and processes of handover. Healthcare improvers should consider incorporating several relevant theories to guide their work to ensure they are equipped to withstand and troubleshoot the demands of ever-changing healthcare settings during the knowledge translation process.
The study findings also highlighted the difficulties associated with implementing a strategy and getting all nurses to carry out the same task, the same way. While this research reduced variability in the content of handovers with the introduction of an eMDS, and decreased cognitive load by providing TLs with a printed handover sheet, there were other human factors to consider that became evident throughout the knowledge translation process. Strategies that are likely to be beneficial include ensuring the nurse receiving handover knows how to listen, monitor and verify information received by repeating back important information, clarifying inconsistencies and confirming the information has been interpreted correctly. These steps can contribute to the reduction of cognitive bias, while also closing the feedback loop (Young et al., 2016).

The ICU CIS in this study is used widely throughout Australian ICUs. Although CIS are meant to improve efficiency and patient safety in healthcare organisations, this study identified many limitations of the ICU CIS, including an inability to meet user needs. It is imperative that vendors work with end-users, researchers and IT teams to ensure end-user needs are met. This will increase end-user satisfaction and effective adoption of CIS. Also, vendors need to ensure CIS fulfil national safety standards to ensure that patient safety is not compromised with the introduction of a CIS (Lin, 2017).

5.6.3 Research

In the future, all healthcare settings nationally and internationally are likely to replace paper forms with CIS, becoming paperless environments. Further work is urgently required to test eMDS in other ICU settings with larger sample sizes. It is also important to develop eMDS for other levels of handovers in the ICU including nursing,
medical and allied health staff. There are other types of handovers that require further exploration. These include transfers into and out of ICU from emergency departments, operating theatres, wards and other external facilities. Each healthcare area is unique and functions differently, therefore it is imperative that researchers and end-users collaborate closely with vendors and IT teams in the development of electronic interfaces for CIS. This will ensure user needs are met, national and international standards are fulfilled and, importantly, that patients receive high quality care that is free from errors. Further work is required to explore human factors to enable researchers to understand how groups of people interact with tools, equipment, environments and their response to change (Redley & Waugh, 2018). This knowledge enables researchers to design systems that are user-friendly and support the strengths and limitations of a designated population. Finally, the relationship between electronic handover tools and patient outcomes (i.e. ICU length of stay, error rates, efficiency of care) needs to be examined to inform further modifications to eMDS and improvements to the handover process.

Future research involving the development and implementation of electronic interfaces will require researchers to consider the necessary resources to effectively translate this new knowledge into clinical settings. These include the skills and number of people required in a team, the infrastructure, and the costs and logistical components to conduct the research. The team requires expertise in human factors, knowledge translation and clinical practice to competently integrate evidence into practice. It is also important that the team has the capacity to engage the entire organisation at the micro, meso and macro levels, to optimise and embed practice change. Researchers need to ensure the project is adequately funded to engage with
industry (e.g. CIS vendors), and that infrastructure can support the practice change (e.g. a CIS that can be manipulated to accommodate user needs). They also need to ensure the study is fully resourced with equipment (e.g. technology, simulation) and other supplies to streamline the knowledge translation process. Further to this, logistical factors must be considered. These include working with managers to facilitate nurses’ time away from the ICU; to test new strategies in simulated environments, and to receive adequate training, to ensure nurses have the skills to competently integrate new strategies into clinical practice, without compromising patient safety during transitions of change. Once electronic handover tools have been tested and validated for use, outcome studies are required to identify whether electronic handover tools are associated with improved patient outcomes.

5.7 Conclusion

In conclusion, a highly cited conceptual framework was used to guide the development, implementation and evaluation of an eMDS for nursing TL shift-to-shift handover in the ICU. Phase 1 findings highlighted variability and a lack of structure in the content discussed curing handover and aspects of TL handover that did not meet the NSQHSS. In Phase 2, TLs identified content for inclusion in an MDS, which led to the development of an eMDS. Phase 3 involved the implementation and evaluation of an eMDS for nursing TL handover in the ICU. In this phase the barriers and facilitators to knowledge use were identified and, based on this understanding, implementation strategies to translate knowledge into practice were devised. Important improvements to the process of nursing TL handover were identified leading to improved communication practices between TLs, likely leading to enhanced patient safety.
Improvements to handover included: the introduction of an eMDS to standardise the content of nursing TL handovers in the ICU; the relocation of handovers from the central ICU desk to the bedside to facilitate safety checks and content clarification between oncoming and outgoing TLs; and the alignment of nursing TL handover practices with the NSQHSS – Clinical Handover.

While the eMDS requires further testing and modifications, it is the first evidence-based handover tool developed for the MetaVision CIS (MDsoft®, Düsseldorf) that can be utilised and adapted by other ICUs. The use of simulation in conjunction with education and training is the next step to inform relevant changes to the eMDS, and optimise nursing TL handover practices in the ICU. Continual iterations of the handover eMDS should occur in collaboration with vendors, IT teams and in alignment with national guidelines, to optimise patient safety. Organisations need to recognise the value of knowledge translation by investing the funds to successfully implement and sustain the use of scientific evidence into practice. Evidence-based practices that are embedded in healthcare settings will ensure patients receive a high standard of care, reduced adverse events and improved patient outcomes. Continued development and testing of eMDS to aid handover in ICU and other clinical settings, will be needed in the future to improve practices and increase patient safety.
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### Appendix 1:

Content analysis

<table>
<thead>
<tr>
<th>ISBAR</th>
<th>Identify</th>
<th>Situation</th>
<th>Background</th>
<th>Assessment</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Systems</td>
<td></td>
<td></td>
<td></td>
<td>CNS</td>
<td>CVS</td>
</tr>
<tr>
<td>Handover 1</td>
<td>Patient 1</td>
<td></td>
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<tr>
<td></td>
<td>Patient 2</td>
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<td>Patient 3</td>
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<td>Patient 4</td>
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<td></td>
<td>Patient 5</td>
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<tr>
<td>Handover 2</td>
<td>Patient 1</td>
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<td>Patient 2</td>
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<td>Patient 3</td>
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<td></td>
<td>Patient 4</td>
<td></td>
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</tr>
</tbody>
</table>

### Deductive content analysis

**CODES**

### Inductive and deductive content analysis

#### Deductive categorisation
- ISBAR e.g. Identify, Situation, Assessment & Recommendation
- Body systems e.g. CNS, CVS, RESP, GIT, Renal, Skin, Social

#### Inductive categorisation
- Additional categories e.g. Alerts, discharge status, staffing etc
- Subcategories e.g. CNS – neurological assessment, pain, medications
Appendix 2:

Survey to assess barriers and facilitators to knowledge use in the ICU

Demographics

| Date: _______________________________ | Hours: ☐ Full time ☐ Part-time | If part-time how many hrs/wk? ______________________ |
| Age (years): ☐ ≤ 25 ☐ 26-30 ☐ 31-35 ☐ 35-40 ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ 61-65 ☐ ≥66 |
| Gender: ☐ Male ☐ Female | Position: ☐ CN ☐ RN |

Nursing experience:

Number of years nursing: ☐ ≤ 5 years ☐ 6–10 years ☐ 11-20 years ☐ ≥ 21 years

Number of years working as TL: ______________________

<table>
<thead>
<tr>
<th>Part 1 Please rate the extent to which you agree/disagree with each of the following statements regarding work unit guidelines &amp; knowledge use in GENERAL</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am familiar with the work unit guidelines (WUGs) in intensive care (ICU)</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2</td>
<td>WUGs help to improve my knowledge in ICU</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3</td>
<td>There are so many WUGs it is nearly impossible to keep up</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>4</td>
<td>In ICU, I find WUGS readily available</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5</td>
<td>I don’t have time to stay informed about available WUGs</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6</td>
<td>WUGs are practical to use</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>7</td>
<td>Generally, WUGs are cumbersome and inconvenient</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>8</td>
<td>WUGs are difficult to apply to my specific practice</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9</td>
<td>In ICU, WUGs are important</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10</td>
<td>WUGs improve patient outcomes</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11</td>
<td>WUGs interfere with my professional autonomy</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12</td>
<td>Generally, I would prefer to continue my routines and habits rather than to use WUGs</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13</td>
<td>I am not really expected to use WUGs in ICU</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>14</td>
<td>WUGs help to standardise care</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

* Work unit guideline (WUG)
### Part 2. This section relates to the Clinical Handover work unit guideline & knowledge use in relation to nursing Team Leader handover in ICU.

**Answer yes/no to following questions.**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am aware that a Clinical Handover ICU work unit guideline (WUG) exists</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2</td>
<td>I have read the Clinical Handover ICU WUG</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3</td>
<td>I conduct handover in line with the ICU Clinical Handover WUG</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Rate the extent to which you agree/disagree with each of the following statements**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>The Clinical Handover WUG is readily accessible if I want to refer to it</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>5</td>
<td>If I use the Clinical Handover WUG in ICU, it will decrease the likelihood of miscommunication during nursing Team Leader (TL) handovers</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>6</td>
<td>Explain your reason.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>If I follow the Clinical Handover WUG it is likely that my TL handovers will contain relevant information</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**Implementation of a minimum dataset (structured handover tool) for TL handover**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>A structured TL handover tool would be beneficial to ICU patients</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>9</td>
<td>The ICU NUM/CNC expects me to use a structured handover tool during TL handover</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>10</td>
<td>Use of a structured handover tool will be based on sound scientific evidence</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>11</td>
<td>I do not wish to change my handover practices, when a structured handover tool is implemented for TL handover</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>12</td>
<td>A structured handover tool for TL handover has the potential to be cumbersome &amp; inconvenient</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>13</td>
<td>I do not have time to use a structured handover tool for TL handover</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>14</td>
<td>For me, the most important factor that would influence me to use a structured handover tool during TL handover would be:</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>15</td>
<td>For me, the most important barrier to using a structured handover tool for TL handover is:</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Question</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Somewhat disagree</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>An electronic handover tool would be beneficial to ICU patients</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Do not wish to change handover practices, when an electronic tool is</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>implemented for TL handover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>An electronic handover tool has the potential to be cumbersome &amp;</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>inconvenient</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I would prefer to use an electronic handover tool rather than a paper</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>based handover tool</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Do not wish to carry out TL handover at the bedside</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>For me, the most important factor that would influence me to use the</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>electronic TL handover tool is:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>For me, the most important barrier to use the electronic TL handover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tool is:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At TL handover, I use the following items to conduct handover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Place a number next to each option.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1=Never, 2=Rarely, 3=Sometimes, 4=Almost always</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>__ Paper handover form</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Templates on MetaVision, specify templates?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Nothing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>___ Other, please specify?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 3:
Audit to assess team leader compliance with an evidence-based eMDS

<table>
<thead>
<tr>
<th>Date:</th>
<th>ICU area: 1 2 3</th>
<th>Observation No:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Gender (circle): Male</td>
<td>Female</td>
</tr>
<tr>
<td>2</td>
<td>Nursing experience: No of years nursing:</td>
<td>No of years ICU:</td>
</tr>
<tr>
<td>3</td>
<td>Shift (circle): D-N</td>
<td>N-D</td>
</tr>
<tr>
<td>4</td>
<td>Handover location (circle): Desk</td>
<td>Bedside</td>
</tr>
<tr>
<td>5</td>
<td>Interruptions: No:</td>
<td>Source:</td>
</tr>
<tr>
<td>6</td>
<td>Handover tools used/referred to: TL handover tool</td>
<td>Ward view</td>
</tr>
</tbody>
</table>

### 2.0 TL handover checklist

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>UNIT FLOW &amp; MANAGEMENT (if min 1 mentioned)</td>
<td>TL unit overview paper template</td>
<td>Mentioned in handover</td>
<td>Equipment issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### IDENTIFY (if mentioned)
- Name
- Age/DOB
- Days in ICU/Date admitted
- UR number
- Bed number
- Admitting consultant

#### SITUATION (if mentioned)
- Diagnosis (coronary artery disease, exacerbation of COPD, pneumonia)
- Reason pt admitted to ICU (airway management) N/A=if cardiac Sx
- Surgical procedure (CABG, MVR, THR) N/A=no surgery
- ARP

#### BACKGROUND (if mentioned)
- Medical/surgical history
- Current issues during shift (access, need IAL urgently, bleeding BP)
- Management of current issues (IAL inserted, blood products, inotropes)

#### ASSESSMENT (if mentioned)
- Central Nervous System (Head wise/Neuro-wise)
  - Acknowledge system
  - Observations discussed
- Respiratory System (Ventilation-wise)
  - Acknowledge system
  - Observations discussed
- Cardiovascular System (Heart wise/chest-wise)
  - Acknowledge system
  - Observations discussed
- Gastrointestinal Tract System (Bowels-wise)
  - Acknowledge system
  - Observations discussed
- Renal System (Kidneys)
  - Acknowledge system
  - Observations discussed
- Skin System
  - Acknowledge system
  - Observations discussed
- Social System
  - Acknowledge system
  - Observations discussed

#### RECOMMENDATIONS (if mentioned)
- Follow ups (chase blood results, order medication, organise Bronch)
- Patient plan (wean inotropes, dialyse patient, remove 2L) Don't include pt going to ward
- Consults/referrals (family meeting, speech review, wound review)
- D/C status (patient going to ward)

#### OTHER (if any items mentioned from this list)
- Alerts – allergies, infection status, infection site, precautions, PRIMES
- Patient management–EOL plan, investigations (results/scheduled), antibiotics

Date: ICU area: 1 2 3 Observation No: 323
Appendix 4:

Survey to assess team leaders’ perceptions of an eMDS for handover

1.0 Demographics

<table>
<thead>
<tr>
<th>1 Date:</th>
<th>2 Hours:</th>
<th>3 If part-time how many hrs/wk?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>☐ Full-time ☐ Part-time</td>
<td></td>
</tr>
</tbody>
</table>

4 Position: ☐ CN ☐ RN
5 Gender: ☐ Male ☐ Female
6 Age: ☐ ≤ 25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ 61-65 ☐ ≥66
7 Number of years nursing: ☐ ≤ 5 years ☐ 6–10 years ☐ 11-20 years ☐ ≥ 21 years
8 Number of years nursing in ICU: 
9 Number of years in TL role: 

<table>
<thead>
<tr>
<th>2.0 Perceptions (Circle the answer that applies to you)</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree or disagree</th>
<th>Somewhat Agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Team Leader receiving handover</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 I am able to ask questions about information that has been provided to me at handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>2 I am provided with sufficient information about patients at handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3 The format in which information is provided to me at handover is easy to follow</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>4 The information that I receive is easy to follow</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>5 I am able to remain focused at handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>6 I am informed about different aspects of nursing care during handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>7 Patient information at handover is provided in a timely fashion</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>8 I feel that important information is not always given to me at handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>9 I am given information during handover that is not relevant to patient care</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>10 I can obtain the handover information from the patients’ electronic record instead of using the TL handover tool</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>11 I find it beneficial to visualise the patient during handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>12 The information that I receive at handover is ambiguous?</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>13 The new handover tool extends the time needed for handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

Team Leader delivering handover

| 14 The new handover tool helps me to deliver a succinct handover | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
| 15 I feel comfortable handing over confidential information at the bedside | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
| 16 I use strategies to appropriately discuss sensitive information at handover | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
| 17 I am often interrupted by colleagues, patients &/or their significant others during handover | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
| 18 I have the opportunity to debrief with other colleagues at handover when I have a difficult shift | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
| 19 I have the opportunity to discuss how patient issues were managed during the shift | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
| 20 I have the opportunity to discuss workload issues at handover | 1                 | 2       | 3                 | 4                        | 5             | 6     | 7             |
2.0 Perceptions continued ……
(Tick the answer that applies to you)

<table>
<thead>
<tr>
<th></th>
<th>Perceived activity</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Somewhat disagree</th>
<th>Neither agree or disagree</th>
<th>Somewhat agree</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>I share the upcoming plans for patient care during handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>22</td>
<td>I give advice to the oncoming Team Leader during handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>23</td>
<td>I invite patients to participate in the handover process</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>24</td>
<td>I invite family members to participate in the handover process</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>25</td>
<td>There is enough time for me to deliver handover</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>

3.0 Advantages and disadvantages of using an electronic minimum dataset (eMDS) for TL handover

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I use the electronic TL handover tool?</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>2</td>
<td>I carry out bedside handover</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>3</td>
<td>What are the advantages of using the electronic eMDS for TL handover?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>What are the disadvantages of using the electronic eMDS for TL handover?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.0 Suggestions for improvement

<table>
<thead>
<tr>
<th></th>
<th>Suggestion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Suggest ways to improve the eMDS for TL handover?</td>
</tr>
</tbody>
</table>
Appendix 5:

Ethical approval obtained from TPCH and GU HRECs

Ms Naomi Hammond  
c/- Amanda Corley  
Critical Care Research Group  
The Prince Charles Hospital

Human Research Ethics Committee  
The Prince Charles Hospital  
Metro North Health Service District  
Rode Road, Chermside QLD 4032

Executive Officer  (07) 3139 4500  
Research & Ethics Ph:  (07) 3139 4691  
Office Ph:  (07) 3139 4691  
Fax:  (07) 3359 5756  
Our Ref: PI/J1/Final Approval - Low Risk

19 January 2010

Dear Ms Hammond,

Re: HREC/10/QPCH/5: Understanding Current ICU Nursing Handover Practices as a Baseline for Improvement. N. Hammond, A. Corely, A. Spooner, J. Fraser, W. Chaboyer

I am pleased to advise that The Prince Charles Hospital Human Research Ethics Committee reviewed your submission and upon recommendation, the Chair has granted final approval for your low risk project.

Approval of this project is subject to the same confidentiality and privacy requirements as apply to other research projects and research subjects are not recognisable in publications or oral presentations.

If you intend to publish the results of your work, it is advisable to ascertain from prospective journal editor/s the actual requirements for publication e.g. some journals may require full ethical review of all studies. When results are published, appropriate acknowledgment of the hospital should be included in the article. Please forward copies of all publications resulting from the study for inclusion in the Internet website list.

On behalf of the Human Research Ethics Committee, I would like to wish you every success with your research endeavour.

Yours truly,

Anne Carle  
A/Executive Officer – Research, Ethics and Governance Unit  
Email: Anne.Carle@health.qld.gov.au
Dear Ms Spooner

I write further to the additional information provided in relation to the conditional approval granted to your application for ethical clearance for your project "PR: Examining current ICU nursing handover Practices to improve communication and reduce adverse events" (GU Ref No: NRS/09/13/HREC).

This is to confirm receipt of the remaining required information, assurances or amendments to this protocol.

All conditions have been satisfied.

Consequently, I reconfirm my earlier advice that you are authorised to immediately commence this research on this basis.

The standard conditions of approval attached to our previous correspondence about this protocol continue to apply.

Regards

Ms Kristie Westerlaken
Policy Officer
Office for Research
Bray Centre, Nathan Campus
Griffith University
ph: +61 (0)7 373 58043
fax: +61 (07) 373 57994
e-mail: k.westerlaken@griffith.edu.au
web:

Cc:

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You can find further information, resources and a link to the University's Code by visiting
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