Reducing medication errors by engaging nurses in medication safety research

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CERTIFICATE OF ORIGINAL AUTHORSHIP

I, Albara Alomari declare that this thesis, is submitted in fulfilment of the requirements for the award of PhD in nursing, in the Faculty of health at the University of Technology Sydney. This thesis is wholly my own work unless otherwise reference or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis. This document has not been submitted for qualifications at any other academic institution. This research is supported by the Australian Government Research Training Program.

Signature:

Date

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ABSTRACT

Medication administration errors are a problematic issue in Australia and worldwide, despite previous attempts to reduce medication errors. Most interventions to date focus on isolated, discrete elements and fail to involve nurses in developing solutions. Medications errors in children are of particular concern because they are more susceptible to harm than adults.

This research aimed to recruit nurses to participate in an Action Research Team (ART) to develop, implement and evaluate interventions to reduce medication errors in paediatric patients.

The action research methodology was used over three phases of the study. Phase One aimed to build an overall picture of medication practice in the participating ward. The results of practice observation, medication policy audits, the Safety Attitudes Questionnaire (SAQ), the incident data and focus groups showed that the medication error rate on the ward was higher than the average error rate across the hospital. The contributing factors for these results included busy-ness of the ward, lack of resources and small size of the physical environment, lack of feedback from management, impractical medication policy, and the nurse's perception of medication errors.

Phase Two aimed to develop and implement targeted interventions in the participating ward. The multi-disciplinary research team recruited six clinical nurses to be part of this phase (ART nurses). Five interventions were developed and implemented, moving the medication administration time two hours earlier in the evening shift, introducing medication trollies, updating the medication policy, implementing Safety and Quality meetings (S&Q) and modifying the patient admission forms. Data from the ART meeting minutes and semi-structured interviews with ART nurses were collected to explore the influence of the nurse's participation in this research. The results indicated that ART nurses changed from being stressed and worried about understanding research, to becoming more confident and enthusiastic about what the research could achieve.

The effectiveness of the interventions was evaluated in Phase Three with Phase One data repeated. Additionally, eight semi-structured interviews with the ward nurses were undertaken to explore their perception of the interventions and their experience during the research journey.

Nurses were able to contribute to the research when they were provided with the opportunity and support, which enabled them to take ownership of the research and the subsequent changes they led. The results indicated a noteworthy reduction in the medication administration errors by 57.4% and an increased parent/carer engagement in medication administration at the bedside.

Chapter 1 Introduction

This chapter consists of significant information that was the basis for conducting this research project. It begins with describing the prevalence of medication errors, and its cost in Australia and globally, followed by a definition of medication error. An overview of the prevalence of medication errors in the paediatric population will be provided, as well as the strategies to date that have been implemented with an aim to reduce these errors. The strategies that are currently in place to improve medication safety in Australia are briefly described. At the end of this chapter, the significance and the aim of the study will be provided.

A clear objective of healthcare is to provide patients with high-quality care that is safe and effective (Australian Commission on Safety and Quality in Health Care 2012). However, there is an increasing recognition by Australian governments and healthcare providers that lapses in patient safety result in poorer outcomes for patients and significant costs to healthcare organisations (Australian Commission on Safety and Quality in Health Care 2010). Medication safety is a component of a broader global strategy to improve patient safety and quality of care and has become a key focus of national and international organisations over the last decade. The European Medicines Agency (2013) recognises medication safety as an urgent, and major, global challenge.

The prevalence of adverse patient outcomes associated with medication errors remains unacceptably high (World Health Orgnisation 2016), despite efforts to enhance medication safety. The World Health Organisation (WHO) (2016) estimates that more than 50% of all medications are prescribed, dispensed or used inappropriately. A landmark report by the United States of America (USA) Institute of Medicine (1999) revealed that, on average, a hospital patient is subjected to at least one medication error per day. These medication errors may occur at any time of prescribing, dispensing or administering the medication (Institute of Medicine 1999). Although the impact of adverse medication incidents on mortality and/or patients' quality of life has not to date

been thoroughly explored, available data suggest that the cumulative personal and financial burden to society is substantial (World Health Orgnisation 2016).

In the US, the Institute of Medicine has estimated that approximately 1.5 million patients experience adverse outcomes as a result of medication errors, costing the healthcare system USD$3.5 billion annually (Moyen, Camiré & Stelfox 2008). Medication errors account for approximately 7000 deaths annually in the US, resulting in an annual expenditure of USD$77 billion to treat drug-related morbidity (Choo, Hutchinson & Bucknall 2010). The high rate of medication errors and associated adverse effects reflect the complexity of the medication process.

In Australia, medication-related incident rates are consistent with the global data (Elliott & C. Booth 2014). Medication errors remain the second most common type of incident reported in Australia (Australian Commission on Safety and Quality in Health Care 2012). Medication errors account for between 14 and 26% of all incidents reported, and medication administration errors occur in 6-18% of all drugs administered (Semple & Roughead 2009). The same study also reports that hospital admissions that resulted from medication errors in Australia were estimated to cost the government and society $660 million dollars per year (Semple & Roughead 2009). The impact of medication errors on patients' quality of life is difficult to quantify. It is likely, however, that the available data underestimate the actual rate of errors (Johnson & Young 2011).

1.1 Definition of medication error

Researchers, administrators and clinicians vary in their definition of a medication error. Miller et al. (2007) conducted a systematic review of 31 paediatric studies investigating medication errors with 14 of these studies focusing on administration related errors. The authors reported that only three out of the 14 studies used a consistent definition. A commonly accepted definition is crucial to unbiased comparisons regarding such errors. Additionally, differences in the definition of a medication error among healthcare organisations can give rise to significant variations in reporting and classification of

medication errors, and can make a comparison between institutions almost impossible.

The most commonly used definition of medication error is the one created by the National Coordinating Council for Medication Error Reporting and Prevention [NCCMERP] (2015), which is

> "*A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient or consumer. Such events may be related to professional practice, healthcare products, procedures, and systems, including the prescribing; order communication; product labelling, packaging and nomenclature; compounding; dispensing; distribution; administration; education; monitoring and use*" (National Coordinating Council for Medication Error Reporting and Prevention 2015).

The NCCMERP urge organisations and researchers to use this standard definition of medication error for uniformity in reporting and analysis of medication errors. This broad definition encompasses actual and potential medication errors, and near misses (Choo, Hutchinson & Bucknall 2010). This is the definition used in this study.

Medication errors are common and can occur in the community and hospital setting (Walsh et al. 2011) and are attributed to patient, provider and health system factors. Errors are associated with increasing volume of medications being administered, the age of the patient, types of medication, the complexity of disease, ward acuity, skill mix of staff, healthcare worker fatigue, staff shortages, poor training, incorrect medication calculation and systematic failure (World Health Organization 2008).

The medication process is complex and encompasses many more steps than the three commonly discussed: prescribing, dispensing and administering medication. The delivery of a single medication can involve up to 40 steps across the entire spectrum of prescribing,

dispensing, administering and monitoring, and each of these steps provides the opportunity for medication error (Weant, Bailey & Baker 2014). Therefore, it is easy to see the potential for error given the complexity of the medication process (40 steps), the human factor (staff) involved in the process, and the receiver of the medication (the patient).

This project will address the administration phase of the medication process for a number of reasons. Firstly, medication administration is the phase that falls under the scope of nurses. Nurses are the main healthcare professionals who frequently administer medications in inpatient healthcare settings, thus, they are the last line of defence to safeguard against medication errors. On a regular nursing shift, nurses spend between 16% (Garrett & Craig 2009) and 40% (Armitage 2008) of their time administering medications and they can administer as many as 50 medications each shift (Sears & Goodman 2012). Due to the high number and frequency of medications administered each shift, and the demanding nature of their role, nurses are at an increased risk for committing an administration error (Sears et al. 2013). The second reason for addressing the administration phase is that interventions targeting this phase have shown little change, while the approaches to reduce prescribing errors (Walsh et al. 2011), as well as dispensing and labelling errors (Bannan & Tully 2016), have been successful in improving medication safety for children. Despite implementing a number of initiatives to address medication errors, the error rates associated with administration continue to increase gradually.

1.2 Medication errors in paediatric patients

Children are highly vulnerable patients; their immature physiology, physical development, communication challenges, lack of autonomy, and dependency on parents and caregivers, places them at highest risk of medication errors (Santell & Hicks 2005). The risk of medication errors is increased for children with complex healthcare needs who are prescribed multiple medications, often from various staff. Children vary in weight, body surface area, and organ maturity, which can affect their metabolic rate and medication excretion (Al-Jeraisy, Alanazi & Abolfotouh 2011).

Medication errors in children have been reported to be five times greater than those seen in adults (Cahill 2009; Wong, Wong & Cranswick 2009). When medication errors occur, paediatric patients have a much higher risk of death than adults (Al-Jeraisy, Alanazi & Abolfotouh 2011). Approximately 31% of medication errors result in harm or death for paediatric patients, in comparison with 13% for adults (Wong, Wong & Cranswick 2009). In a retrospective analysis of 43,287 records in the US, paediatric patients were involved in 333 (9%) out of 3818 error records. One hundred and four (31%) of the 333 errors were cited as harmful or fatal (Cowley, Williams & Cousins 2001). They also found that the common types of medication errors were dose omission (27%) and improper dose or quantity (25%).

The main contributing factors for paediatric medication errors include lack of appropriate paediatric formulations, communication issues between health professionals, and dose calculation mistakes (Wong, Wong & Cranswick 2009). Paediatric dosing is highly variable because doses are calculated based on the weight of the patient. In an exploratory descriptive study of 5,547 children aged up to 11, the researchers reported that medication dosing errors occurred in 125 of the 360 drug administration errors (34.7%) as a result of a deviation from weight appropriate dose, resulting in a dose miscalculation (Hoyle Jr et al. 2012). Therefore, prerequisites for safe administration include the accurate weight of the patient, appropriate calculation of the prescribed dose, and calculation of the drug to be dispensed. Consistent with adults, the potential for error is present in every step of the medication process: prescribing, preparing, administering, and monitoring (Cahill 2009).

Another common cause of medication error in the paediatric population is related to lack of communication with the patient. The lack of communication between healthcare professionals and child patients has prevented the patients and their families from participating in their own treatment plan (Wong, Wong & Cranswick 2009). For instance, nurses may administer medications in a different way than the patient is used to prior to their admission to hospital, without asking the patient or their family. This may result in the patient being vulnerable to medication error, with little opportunity to prevent this themselves (Keers et al. 2013). Medication errors that occur in the administration stage

while children are in hospital can easily be translated into the community after they are discharged (Alomari et al. 2015). Also, poor parent education and support regarding administration of medications can result in medication errors occurring at home (Cahill 2009).

1.3 Strategies to reduce medication errors

The medication process is a complex one involving various healthcare professionals and elaborate systems increasing the risk for medication errors to occur (Pape et al. 2005). Medication errors are rarely the result of a single, isolated human error, but mostly comprise a chain of events leading to an error (Choo, Hutchinson & Bucknall 2010). These errors may result from multiple small breakdowns in the systems in medication management. To respond to these issues in medication practice, multiple attempts have been made to improve medication safety (Alsulami, Conroy & Choonara 2012; Elliott & Liu 2010; Weant, Bailey & Baker 2014).

A systematic review identified 26 recommendations to reduce medication error in the paediatric population (Miller et al. 2007). These recommendations include a range of systems approaches for medication management, such as bar coding, workflow, double-checking during the 'administration' of medications, as well as understanding the contribution of human error in dosing and medication management (Miller et al. 2007). However, these approaches have had variable results and, where positive outcomes have been reported, short-term benefits only have been observed. A traditional method of ensuring medication safety is following the "five rights" of medication administration to prevent errors, which encompasses right patient, right drug, right route, right time, and right dose (Elliott & Liu 2010). Although the five rights are regarded as a basic standard for safe medication practice, nurses still make many administration errors (Choo, Hutchinson & Bucknall 2010). The five rights do not reflect the complexity of medication administration in practice and reliance on the rights alone, to guide practice, may limit critical thinking by nurses (Institute for Safe Medication Practices 2007; Macdonald 2010). The evidence for this argument is that despite the "five rights" approach, medication errors still occur due to the environmental factors that may affect the

medication process, such as busy-ness of nurses (Macdonald 2010). While the "five rights" provide a useful checking ritual, they focus on the individual nurse's performance during the final stage of medication administration, which may not prevent the medication errors in other stages of the medication process.

Due to the limitations surrounding sole reliance on the "five rights" for medication administration, efforts have proceeded to add additional "rights". Cook (2007) proposed a series of rights for nurses that included the right to have legible orders, correct drug dispensing, timely access to information, procedures in place to support medication administration and the time it takes to administer medications safely. More recently, Elliott and Liu (2010) proposed nine "rights" of medication administration. In addition to the five rights, the authors added the right response, right documentation, right action and right form (Elliott & Liu 2010). The authors do not guarantee that medication errors will not occur, however, they indicated that by following the nine rights it would help ensure the safety and quality of patient care during the medication administration process. For a nurse to verify the rights of the medication process a conducive environment, without unnecessary disruptions, and adequate staffing patterns must be present (Kim & Bates 2013). Medication administration is part of a complex system of care delivery, and all aspects of the system must be functioning properly to minimise the chance of error during the delivery of patient care (Institute for Safe Medication Practices 2007). Thus, quality in medication administration is not simply a matter of adhering to these medication rights.

Double-checking is another approach aimed at improving medication safety, by decreasing the risk of medication administration error (Kunac & Reith 2005). Conducting a double check is where one person reviews and signs off on another's activity (McCall 2017). Due to a lack of empirical evidence demonstrating the effectiveness of double-checking in reducing medication errors, its utility is debatable. The authors of one systematic review of double-checking found that there is insufficient evidence to support the efficacy of double-checking (Alsulami, Conroy & Choonara 2012). On the other hand, the recommendation from other systematic reviews states that nurses should double check

medications, as a strategy for reducing medication errors (Hodgkinson et al. 2006; Jensen et al. 2004).

Double-checking is susceptible to confirmation bias (Kassin, Dror & Kukucka 2013). Independent double-checking has been suggested as a method to minimise the weaknesses associated with the process of double-checking (Gosbee 2006). Independent double-checking involves the healthcare professional confirming independently that the dosage is correct; without any input from the first practitioner, the second practitioner compares their answer with the first practitioner's results to confirm that it is correct (Baldwin & Walsh 2014). Independent double-checking is more effective with high-risk medications, complex processes such as calculating doses, or high-risk patient populations such as infants and children (Grissinger 2006).

The interventions to reduce medication errors have focused on isolated, discrete elements of medication management, such as prescribing, and have failed to consider these within the complex structure of child/family, health provider, healthcare systems, and the overall organisational safety culture, that influence care outcomes. Despite clear documentation of the medication administration problems and decades of medication safety research, researchers have failed to identify innovative and sustainable solutions to reduce medication administration errors (Miller et al. 2007). Due to the limitations associated with strategies to reduce medication administration errors, the need for a comprehensive and sustainable approach is becoming urgent. This approach needs to include all key players, such as nurses, families and healthcare organisations (Arango 2011).

Another strategy to improve medication safety, suggested by research literature, is involving patients and families in the medication process (Manley et al. 2011). Involving patients in issues related to their own safety may improve the safety of healthcare delivery (Macdonald 2010). The patient can contribute to the reduction of medication incidents if they receive enough support (Davis et al. 2007). For example, patients who are given appropriate information about the purpose of medicines and their likely effects, including

side-effects, are more likely to take the medication as recommended, leading to better health outcomes and helping avoid medication errors (Koutantji et al. 2005; Vincent & Coulter 2002). Patient involvement in the medication safety agenda is crucial to the delivery of appropriate, meaningful and safe healthcare (Berwick 2013). However, for this patient involvement (in this case families) to succeed, communication channels should be open and decisions must be collaborative, with a willingness from both sides to negotiate care approaches as needed (Arango 2011). Patient and family involvement in the safety agenda has been widely advocated as integral to potentially reducing the risk of harm as a result of receiving care (Manley et al. 2011). The centrality of the patient in supporting a safety agenda has been highlighted in a report in the United Kingdom (UK) on improving the safety of patients (Berwick 2013), which suggests that organisations make patient safety their top priority, placing it above all other aims. This report extends the previous notion of 'patient' engagement to that of the 'patient and their carer'. In the context of medication management, this suggests that providing opportunities for patients and families to observe and model positive behaviours of medication management in the clinical setting may act as a learning opportunity for families. Families can learn from observing nurses, asking questions and discussing any issue related to their child's medication (Davis et al. 2007). This learning opportunity is more likely to result in more effective care when the patient is discharged from the hospital and their family will be the main responsible carer for them in the community. Lack of involvement of families in the medication process during their stay in hospital increases the time required to prepare families for safe medication administration practice in the community, and fails to capture their insight about medication administration practices and ideas about how this might be improved (Blomqvist et al. 2010).

Involving nurses in research has a direct positive impact on the safety of healthcare (Squires et al. 2011). Promoting a research culture enables nurses who provide direct patient care to develop, implement and evaluate their own medication research initiatives (Hines, Ramsbotham & Coyer 2015). Enabling nurses and midwives to use research methods in their practice increases the amount of nurse/midwife-led evidence-based innovation (Crozier, Moore & Kite 2012). However, although nursing research is promoted in the academic setting, many nursing research projects lack formal nursing

engagement (Jefferies et al. 2010). In medication safety research, despite the key role of nurses in the medication safety agenda, nurses have not been actively engaged in research (Durham 2015).

1.4 Medication incidents management in Australia

There are multiple national organisations participating in regulating medication practice in Australia, and specifically in New South Wales (NSW). These organisations include the Ministry of Health (NSW), Australian Commission on Safety and Quality in Healthcare, and the Australian Council for Safety and Quality in Health Care.

The Ministry of Health has implemented a medication handling policy to be used across the health organisations in NSW. This policy consolidates best practice principles on medication procurement, storage, prescribing, supplying, dispensing and administering medications at NSW public health facilities. In this policy, the competency to administer medications is included in the qualifications of medical practitioners, dentists, nurse and midwife practitioners, registered nurses, registered midwives and Endorsed Enrolled Nurses (EEN), but only in accordance with any practice conditions imposed by the place of employment and the endorsements, notations and conditions on the person's registration (NSW Ministry of Health 2013).

According to this policy, nurses must check the five rights of medication during the medication process. In addition to the five rights, the medication handling policy clearly indicates that the nurse must check the patient for allergies and the expiry date of each medication before administration. A double-checking should be used before certain medications are administered. Double-checking medication includes, as a minimum, all doses administered by injection and all doses administered to children up to their 16th birthday. Furthermore, all staff must report every medication incident, including near-miss incidents, and probable adverse events associated with medication using the facility's incident management system detailed in Policy Directive 'Incident Management'. According to this policy, all medication incidents must be reported in a

software system called the Incident Information Management System (IIMS).

The National Safety and Quality Health Service (NSQHS) Standards were developed by the Australian Commission on Safety and Quality in Health care (ACSQHC) in consultation and collaboration with jurisdictions, technical experts and a wide range of stakeholders, including health professionals and patients. The primary aims of the NSQHS Standards are to protect the public from harm and to improve the quality of health service provision. A second edition of the NSQHS Standards was released in November 2017 to update the evidence for actions, consolidates and streamlines standards and actions to make them clearer and easier to implement (Australian Commission on Safety and Quality in Health Care 2017). Medication safety is standard number four on the document, which describes the systems and strategies to ensure clinicians safely prescribe, dispense and administer appropriate medicines to informed patients (Australian Commission on Safety and Quality in Health Care 2012).

In 2006, the Australian Council for Safety and Quality in Healthcare developed a standard medication chart designed to reduce the potential for errors in the medical management cycle. Previously, Australian hospitals used a wide variety of medication charts, with some hospitals using multiple charts for the prescription of medications. This standard medication chart is known as the National Inpatient Medication Chart (NIMC). According to the guidelines and the NIMC, a medication order is only valid if the medical officer completes all the required fields in the chart, which comprise the date, generic name, route of administration, dose, frequency and administration time(s), indication, signature, name and contact details (Atik 2013). A study sought to establish whether a standard NIMC could reduce the frequency of prescribing errors and improve the completion of adverse drug reaction in 22 Australian hospitals (Coombes et al. 2011). The study found that after the introduction of the NIMC, prescribing errors decreased by almost one-third, from 6383 errors in 15557 orders to 4293 errors in 15416 orders ($P=<0.001$). Despite the introduction of the NIMC and the subsequent reduction in prescribing errors, errors related to the administration phase remain at unacceptable levels.

In summary, medication errors remain a significant problem in the Australian healthcare system (Roughead & Semple 2009). Many specific strategies are identified that, when implemented, have the potential to reduce the incidence and severity of medication errors. However, none of these strategies reflects the complexities associated with medication administration in a hospital setting, and they fail to consider human and system factors (Durham 2015). The NCCMERP clearly advises that there is no acceptable incidence rate for medication errors and that the goal should be to continually improve healthcare systems so that medication errors are prevented (National Coordinating Council for Medication Error Reporting and Prevention 2015). There is a need to support research which continues to monitor the rates of medication problems in Australian hospitals and to implement evidence-based interventions to reduce medication errors (Semple & Roughead 2009).

Due to paediatric patient's physiological needs, children are at a higher risk of experiencing adverse medication effects than adults. Therefore, understanding the contributing factors of medication errors can assist the development of strategies to improve medication safety in paediatric patients on a variety of levels. The development of interventions should include key stakeholders, such as nurses, parents and patients, in future research. More specifically, because nurses are responsible for the medication administration stage, the final steps in the medication safety chain, their involvement in medication safety research is essential.

1.5 The significance of the study

This thesis is part of a large multidisciplinary collaborative study aimed at reducing medication administration errors in the paediatric inpatient setting, by bringing families and nurses to work together. This thesis is only reporting the data and the results of the nurses' participation in the project. It does not report on engaging the parents in the research and the associated data, as this part of the overall study was led by another

researcher. My role as a researcher will be discussed in detail in the methods chapter (Chapter Three), which highlights the aspects of the study that I led.

This project addresses an important problem, that being, medication errors and their impact on patient safety and the need for patient safety to be prioritised in organisations. This project will have positive outcomes on paediatric patients' health and will improve the overall safety culture in the clinical unit. Strategies and processes that engage nurses, enable collaboration, foster openness, and create a supportive space for critical thinking and reflection, in order to reduce the risk associated with medication administration for children, will be developed in this project. This project focuses on medication safety for children as they have been shown to be at higher risk for medication errors.

1.6 The aim of the study

The overall goal of this research is to reduce medication administration errors in the paediatric inpatient setting. This will be achieved through the following aims:

1. Identify the barriers and facilitators to safe medication practice.
2. Develop and implement targeted interventions to reduce medication errors.
3. Evaluate targeted interventions developed by nurses to improve medication safety.
4. Understand how nurses engage in research and lead changes in practice.

1.7 Overview of the thesis

This thesis is presented in six chapters. Figure 1-1 shows the structure of the thesis.

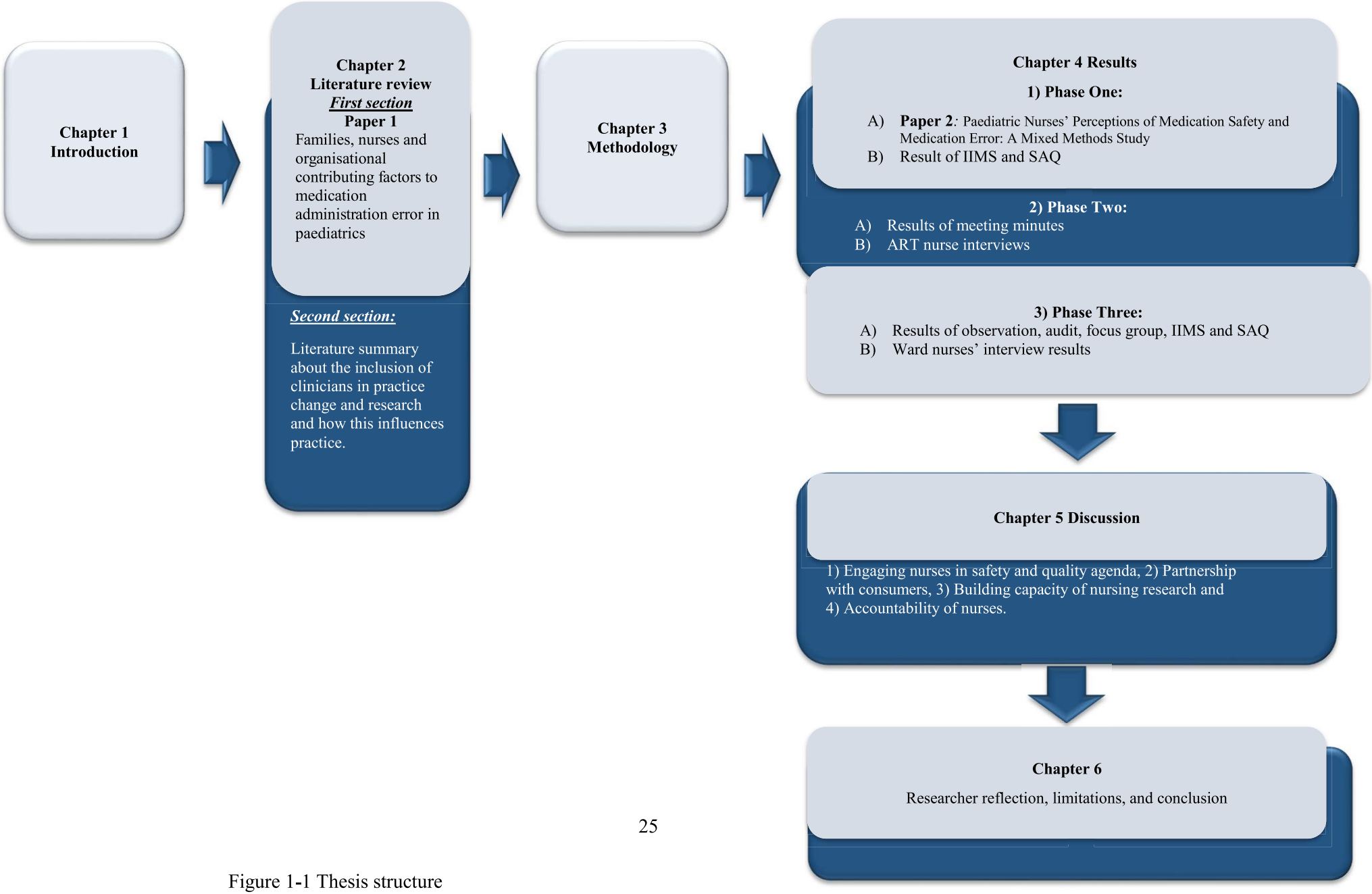

Figure 1-1 Thesis structure

Chapter One has described the prevalence and the significance of medication errors globally and in Australia. The definition of medication errors is also provided. The multiple attempts that have been undertaken to improve medication safety were also described, along with an overview of the medication incidents management in Australia.

Chapter Two has two parts. The first part includes a published literature review, which provides an analysis of the literature related to the contributing factors of medication errors, and provides recommendations for future strategies to improve medication safety. Based on the findings of the literature review, recommendations are offered that involve including nurses and families in medication safety research and in any future interventions to reduce medication errors. The second part of this chapter summarises the literature regarding the inclusion of clinicians in practice change and research, and how this influences practice.

Chapter Three presents the research design used in the study. The aim of the study was to develop and implement interventions to improve medication safety by bringing families and nurses together as part of the Action Research Team (ART). Action research (AR) was identified as the most appropriate approach to meet the aims of this study. This chapter outlines the reason for choosing AR, how AR was employed in the study and the considerations that were necessary before conducting the three AR phases. The information about the ethical process, forms of consent used, information sheet, data storage and other research-related ethical issues are provided in this chapter.

Chapter Four presents the findings of the three phases of the study. In Phase One, the findings of observations, the audit tool and focus group results were combined and presented in a published paper in 2016. In addition, the results of the Safety Attitudes Questionnaire (SAQ) and IIMS are presented as the second part of Phase One data results. In Phase Two, the research team meeting minutes are presented as a journey map, showing the journey of developing and implementing the interventions in the targeted ward. The themes that emerged from the interviews with nurses who participated in the

ART are also presented. The results of these interviews showed the development of nurses during their participation in this research. Phase Three repeated the data collection undertaken in Phase One, and the results were then compared to evaluate the effectiveness of the implemented interventions. Additionally, the themes from the results of the ward nurses' post-intervention interviews are outlined, including exploring their perception of practice change and their perception of research.

Chapter Five provides a discussion of the key findings that emerged during the study period. This includes improving the safety agenda through nursing engagement, building nursing research capacity, partnering with consumers and accountability of nurses. Finally, recommendations for practice change and for future research are also presented.

In *Chapter Six,* the limitations and conclusion of the study are outlined. This chapter also centres on my reflections captured during the study period. The key areas found within the reflective diary that formed part of the AR process include the learning process of a novice action researcher and the experiences of an outsider researcher who then became an insider researcher. The chapter will conclude with who am I now as a researcher.

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Chapter 2 Literature Review

2.1 Introduction

The introductory chapter presented the context and rationale of this research study. It drew attention to the immense challenges of medication safety in the adult and paediatric settings in Australia and globally. The chapter outlined that medication errors are a national and international issue, and comprehensive and sustainable solutions are urgently needed.

This chapter presents the findings of a literature review undertaken to provide an in-depth insight into the factors and strategies that impact on medication administration errors occurring in paediatric patients. The literature review highlighted the role of nurses, families and healthcare systems in the medication process. This literature review was published in the International Practice Development Journal (IPDJ) in 2015. The paper is presented in its published format (see Appendix 1) with the permission from IPDJ. Appendix 2 shows the permission from IPDJ for inclusion of the paper in this thesis. The second part of this chapter presents a summary of the literature about engaging nurses in practice change and research to improve their practice. This chapter will conclude with key recommendations from the literature.

2.2 Families, nurses and organisations contributing factors to medication administration error in paediatrics: a literature review

Abstract

Background: Medication error is the most common adverse event for hospitalised children and can lead to significant harm. Despite decades of research and implementation of a number of initiatives, the error rates continue to rise, particularly those associated with administration.

Objectives: The objective of this literature review is to explore the factors involving nurses, families and healthcare systems that impact on medication administration errors in paediatric patients.

Design: A review was undertaken of studies that reported on factors that contribute to a rise or fall in medication administration errors, from family, nurse and organisational perspectives. The following databases were searched: Medline, Embase, CINAHL and the Cochrane library. The title, abstract and full article were reviewed for relevance. Articles were excluded if they were not research studies, they related to medications and not medication administration errors or they referred to medical errors rather than medication errors.

Results: A total of 15 studies met the inclusion criteria. The factors contributing to medication administration errors are communication failure between the parents and healthcare professionals, nurse workload, failure to adhere to policy and guidelines, interruptions, inexperience and insufficient nurse education from organisations. Strategies that were reported to reduce errors were double-checking by two nurses, implementing educational sessions, use of computerised prescribing and barcoding administration systems. Yet despite such interventions, errors persist. The review highlighted families that have a central role in caring for the child and therefore are key to the administration process, but have largely been ignored in research studies relating to medication administration.

Conclusions: While there is a consensus about the factors that contribute to errors, sustainable and effective solutions remain elusive. To date, families have not been included as key stakeholders in researching or developing effective interventions to reduce medication administration errors.

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Implications for practice:

- Future solutions to reduce medication errors need to take into account staffing levels, skill-mix, stress and workload
- Organisations need to provide appropriate policies and guidelines as well as access to supportive technology and ongoing educational support aimed at reducing errors
- Engaging nurses, doctors, pharmacists and, most importantly, families in developing practice through person-centred approaches is vital in order to improve the culture of medication safety and reduce medication errors

Keywords: Medication administration, error, nurses, families, children, organisation

Introduction:

Medication error is the most common adverse event during a child's stay in hospital and can lead to significant harm (Wong et al., 2009). Rates of all medication errors are reported at between 3.9%, as a conservative estimate, and around 40.4%, but may be even higher, with non-disclosure a factor (Özkan et al., 2011). A traditional method of ensuring medication safety has been to follow the five rights of medication administration to prevent errors and, more recently, the nine rights of medication administration (Elliott and Liu, 2010). These are:

- Right patient
- Right documentation
- Right drug
- Right action
- Right route
- Right form
- Right time
- Right response
- Right dose

However, achieving the right drug/dose for the right child at the right time continues to challenge paediatric services in hospitals and community healthcare settings (Walsh et al., 2011). Correct dosing, monitoring and treatment adherence are critical to achieving optimal outcomes (Miller et al., 2007). Medication errors occur across the spectrum of prescribing, dispensing and administering processes. They are attributed to family, nurses and organisational factors (Fernández-Llamazares et al., 2012).

Medication errors have been defined as:

'Any preventable events that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient or family. Such events may be related to professional practice, healthcare products, procedures, and systems, including: prescribing; order communication; product labelling, packaging and nomenclature; compounding; dispensing; distribution; administration; education; monitoring; and use' (National Coordinating Council for Medication Error Reporting and Prevention, online, 2015).

Given the multiple potential causes of medication errors, it is therefore vital to look at how they may be prevented from the perspective of the nurses, family and the patient, as well as in terms of the events that influence the medication process. While the medication process may appear simple and linear, there are at least 50 unique steps between prescription and the patient receiving the drug (Hughes and Edgerton, 2005). It is easy to see the potential for error given the complexity of the process and the human and system factors involved in the process.

The medication administration phase is the actual giving of the medication and may involve opening the container, removing (or reconstituting) the prescribed dosage and giving the medication to the patient following the prescriber's orders. This review will address this phase for the following reasons. First, medication administration is the phase that falls under the remit of nurses, who spend at least 16% of their time preparing or administering medication (Garrett and Craig, 2009), administering as many as 50 medications in this timeframe. Due to this high frequency of administration, alongside the other demands of their role, nurses are at increased risk of committing an administration error (Sears et al., 2013). Second, approaches to reduce prescribing errors (Walsh et al., 2008) and dispensing and labelling errors (Cochran et al., 2007) have been successful in improving medication safety for children. However, despite a number of initiatives aimed at improving the administration phase, error rates associated with administration continue to increase gradually (Sears et al., 2013).

Errors associated with the administration phase were reported in 26.9% of paediatric patients (Keers et al., 2013). This is likely to be an underestimate as errors may go unreported because they are not detected, hidden, easily fixed (prescribing errors) or because there is fear of the consequences of reporting (Prot et al., 2005). The errors reported are thought to account for only 5-20% of the incidents that actually occur (Prot et al., 2005). Despite clear documentation of the medication administration problem and decades of medication safety research, researchers have failed to identify sustainable solutions to reduce errors (Keers et al., 2013). Until recently, the incidence of medication errors in paediatric patients has received relatively little scrutiny compared with those in the adult population, and even less has been done to assess prevention of these errors (Fortescue et al., 2003).

The aim of this literature review is to explore the nurse, family and healthcare system factors that impact on medication administration errors in paediatric patients and to identify gaps in the literature and opportunities for improvement.

Methods

A systematic literature review design was chosen in order to provide a comprehensive understanding of how nurse, family and healthcare system factors impact on paediatric administration errors. Systematic reviews inform practice by summarising evidence regarding a specific clinical problem and are the focus of evidence-based practice initiatives (Whittemore, 2005).

Databases

A search of electronic databases was conducted to answer the following question:

What are the nurse, family and healthcare system factors that impact on medication administration errors for paediatric patients?

The databases searched were the Cumulative Index to Nursing and Allied Health

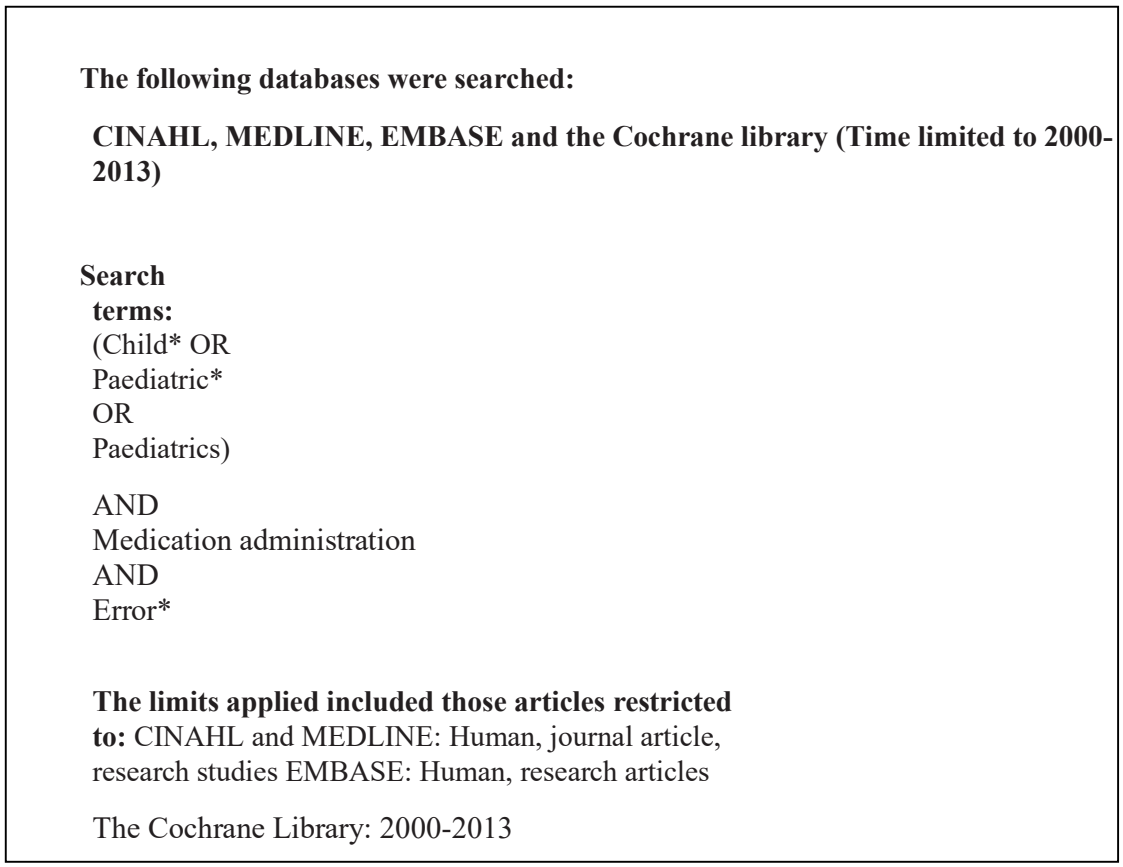
Literature (CINAHL), MEDLINE, EMBASE and the Cochrane library.

Search terms

The keywords used in this search were medication administration, drug administration, error, error* Child*, children, Paediatrics and Paediatric and the combinations are provided in Figure 1.

Family, organisation and nurse were not used as keywords to make the search broader and avoid excluding any related article. During the manual title/abstract and full text screening, the included articles will be classified according to these terms.

Figure 1: Search strategy



Limitations

Limiting criteria specific to each database were applied accordingly (Figure 1).

Inclusion criteria

Only studies reporting the nurse, family and organisational factors contributing to medication administration errors, or reporting interventions aimed at reducing medication errors were selected.

The study population included in this review are children (16 years of age and younger) who received medication either in hospital, at home, at school or in community care.

Exclusion criteria

Articles were excluded if they were not research studies, if they related to medications and not medication administration errors or if they referred to medical errors rather than medication errors.

Screening of search findings

The search of electronic databases retrieved a total of 253 published papers. The papers were imported to EndNote X601® (Figure 2). After removal of 84 duplicate articles, the abstracts and titles of the papers were assessed for eligibility against the inclusion criteria. The results of this preliminary screening process resulted in the identification of 20 articles for full review against the inclusion criteria. The full text of the 20 articles was reviewed and seven were excluded. The remaining 13 met the inclusion criteria and were included in the integrative review (Figure 2). A snowball method was used: the reference lists of the included studies were also searched for further relevant articles that might be eligible for inclusion (Whittemore, 2005). Two more studies that met the criteria were found in the reference lists and included (Fortescue et al., 2003; Morriss et al., 2009), giving a total of 15 included studies.

Figure 2 Screening of search findings

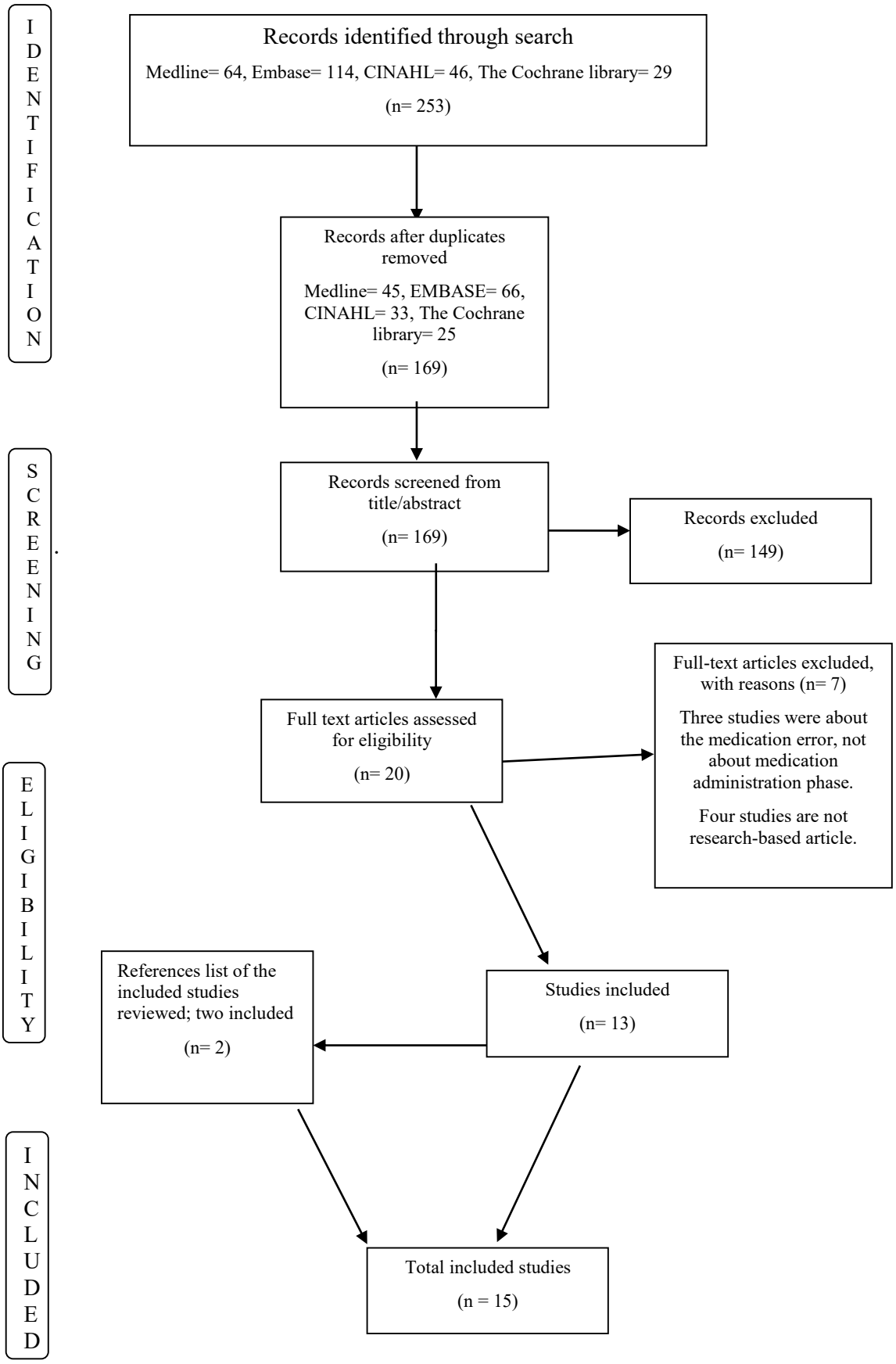


Table 1 Description of the included studies

	Authors/ year	Design/method	Sample/setting	Results
1	Alsulami et al., 2012	Systematic literature review		One RCT reported that double-checking process reduced medication error rates in prescribing, dispensing and administration
2	Chedoe et al., 2012	Prospective study with pre and post-intervention	Nurses at a neonatal ICU; 595 medication doses were observed	Educational sessions for nurses reduce the incidence of medication errors from 41% to 31%
3	Davis et al., 2009	Cross-sectional survey study	278 paediatric nurses from the emergency department, ICU, medical and surgical wards	Junior nurses reported that they do not strictly adhere to medication administration policies and guidelines (P= <0.001)
4	Ficca and Welk, 2006	Cross-sectional survey study	314 school nurses	Two-thirds of participants showed low adherence to medication policies due to workload
5	Fortescue et al., 2003	Prospective cohort study	1,020 paediatric patients in two academic medical centres	The potential preventability of medication errors with: computerized system is 27%; availability of pharmacy in the ward is 85.3%; and improved communication between nurses and doctors is 75%
6	Lemer et al., 2009	Prospective cohort study	1,685 paediatric patients in US	The majority of the families failed to receive written information from the doctors (74.3%) or pharmacists (68.7%): failure of communication
7	Morriss Jr et al., 2009	Prospective observational cohort study	92,398 medication doses were administered to 958 paediatric patients	The barcode medication administration system reduces medication administration errors from 39/1,000 doses to 20/1,000 doses (P=0.008)
8	Murphy and While, 2012	Non-experimental survey design	140 clinical staff working in a children's hospital	The participants reported insufficient training and knowledge (64%), interruption (86%), heavy workload (78%) and communication failure (71%)
9	Oshikoya et al., 2013	Non-experimental survey design	50 paediatric nurses in Nigerian public hospitals	52% of nurses identified workload as a major contributing factor to medication administration errors
10	Özkan et al., 2011	Qualitative and quantitative designs, using interviews and observational methods	25 nurses working in university hospitals in Turkey	Interruptions, lack of experience, workload and insufficient protocols increase the medication administration errors
11	Sears and Goodman, 2012	Retrospective, pan-Canadian study using a survey	372 paediatric nurses from three tertiary hospitals were surveyed	Insufficient nurse training (n = 32), overtime (n = 88) and workload (n = 88) cited as major contributing factors for medication administration errors
12	Sears et al., 2013	Descriptive, prospective, pan-Canadian study	372 paediatric nurses in three tertiary paediatric hospitals in Canada	Workload, distraction and insufficient increase in medication administration errors
13	Stratton et al., 2004	Descriptive survey study	57 paediatric and 227 adult hospital nurses	Nurses identified distractions (50%), workload (37%) and failure to double check doses (28%) as contributing factors to medication administration
14	Taylor et al., 2008	Prospective observational study	526 medication administrations in a neonatal ICU	The computerized physician order entry system reduced medication variances from 19.8% to 11.6%
15	Walsh et al., 2011	Prospective observational quasi-	52 home visits for children with chronic diseases	Physicians were not aware of 83% of the errors occurring at home with parents: failure of communication

Results

The 15 studies included in this review reported the contributing factors (organisational, nursing and family) that increase the risk of medication administration errors, and strategies aimed at reducing these errors. The description of each study and the reported outcomes are summarised in Table 1. The results of the review will be described in relation to organisations, nursing staff and families.

Organisations

Four studies in the review reported on the organisational factors that contributed to the outcomes of medication administration error in children, or on strategies to reduce error rates (Fortescue et al., 2003; Taylor et al., 2008; Davis et al., 2009; Morriss et al., 2009). The key factor is a lack of support from organisational structures to ensure adherence to medication safety guidelines. Strategies to reduce medication administration errors included the use of technology such as barcoding and computerised entry systems, and improving communication between the healthcare professionals.

Organisational contributing factors

Only one paper reported on factors contributing to non-adherence to medication policy and guidelines (Davis et al., 2009). In their descriptive, exploratory, cross-sectional study, the authors used a survey of 278 paediatric nurses from an Australian tertiary paediatric hospital. Junior nurses responding to the survey said they did not necessarily follow the medication policy and believed that their medication administration practice could be influenced by the person with whom they checked the drugs (P=0.001). Senior nurses agreed with these findings, reporting that as senior staff, they dictate acceptable levels of medication policy adherence through role modelling (P=0.001). Although the authors did not find that adherence to medication administration policies would either increase or decrease error, they believed that at an organisational level, health services needed to create multidisciplinary education programs to promote universal understanding of, and adherence to, medication administration policies (Davis et al., 2009).

Organisational strategies to reduce medication administration errors

A prospective, observational cohort study was conducted by Morris et al. (2009) to assess the effectiveness of a barcode administration system to determine whether such a program would decrease medication administration error. The nurse working with this system was required to scan the patient's wristband barcode to select the patient, scan the unit dose medication barcode and administer the medication item. Some 92,398 medication doses were administered to 958 paediatric patients during the study period. The barcode system reduced the preventable adverse drug events from 39/1,000 doses to 20/1,000 doses (P=0.008). The main limitations of this study were that the working culture of the clinical area was not described. Moreover, the authors failed to mention the staff ratio, the cost of implementing the barcode system or the severity of illness of the children.

These omissions may affect the generalisability of the results to other settings. Additionally, although the medication errors post-implementation of barcoding was reduced, significant levels of error did remain and the authors failed to discuss the reason for this result.

Taylor et al. (2008) reported a similar result to Morris et al. (2009), finding that the use of technology supported programs was associated with a decrease in medication administration variances. They reported the outcomes of a computerised doctor order entry system with the variance defined as a discrepancy between the order and the medication administration. The authors conducted a prospective observational study of 526 medication administrations in a neonatal intensive care unit. Medication variances were detected for 19.8% of administrations during the pre-computerised doctor order entry period, compared to 11.6% with computerised doctor order entry. Although there was a significant reduction in the rate of medication administration variances, the authors suggested that additional methods may be needed to improve neonatal patient medication safety further.

In a larger study of 1,020 patients, Fortescue et al. (2003) conducted a prospective cohort study, over a six-week period, to classify the major types of medication errors in

paediatric inpatients and to determine which strategies might be most effective in preventing them. The doctors evaluated pre-suggested error prevention strategies to identify the most effective, using a five-point Likert scale (Fortescue et al., 2003). The involvement of nurses and pharmacists in each morning round with doctors, with the aim of increasing communication, was found to reduce medication administration errors by 75.5% (from 616 to 151). Also, computerised doctor order entry with clinical decision support systems was found to reduce medication error by 27% (from 616 to 450) and the presence of a ward-based clinical pharmacist reduced errors by 81% (from 616 to 115). While these results reflect the potential preventability of the errors and all achieved a significant reduction in the error rates, a significant number of errors persisted.

Nurses

Eight studies reported the contributing factors affecting medication administration from a nursing perspective (Stratton et al., 2004; Ficca & Welk, 2006; Alsulami et al., 2012; Chedoe et a1., 2012; Murphy & While, 2012; Sears & Goodman, 2012; Oshikoya et a1., 2013; Sears et a1., 2013). The studies found similar factors that may increase medication administration errors but only two of the studies reported strategies aimed at reducing error (Alsulami et al., 2012; Chedoe et al., 2012).

Nurse contributing factors

A descriptive study by Stratton et al (2004) surveyed through a pilot-tested coded questionnaire, 57 paediatric nurses and 227 adult hospital nurses to determine nurses' perception of factors that contributed to medication errors. Paediatric nurses report a higher proportion of errors (67%) than adult nurses (56%). Paediatric nurses most frequently reported distraction (50%), workload (RN-to-patient ratio) (37%), volumes of medication administered (35%) and failure to double-check doses (28%) as contributing factors. The self-reporting tool used in this study was limited by the fact that participants reported on a range of specific distractors pre-identified by the researchers rather than identifying factors themselves, which may lead to underestimating the influence of other potential contributing factors (Davis et al., 2009).

In their study of 71 school nurses in Pennsylvania, US, Ficca and Welk (2006) found that a lack of understanding of policies and guidelines with regard to task delegation was a contributing factor to medication administration errors. In self-reported surveys, the nurses indicated that they had responsibility across several sites of their education facility; two-thirds of school nurses delegated some medication administration to unauthorised or untrained personnel, such as principals or school secretaries. While they viewed a perceived lack of support and workload demands as justification for this delegation, it contributed to increasing medication administration errors (Ficca and Welk, 2006). As mentioned previously, the data from self-reported surveys may fail to reflect the full reality of the issue.

More recently, in a prospective quasi-experimental design study of 372 nurses, Sears and Goodman (2012) collected data from three Canadian university-affiliated tertiary paediatric centres through a confidential survey of paediatric nurses. Nurses identified that some factors correlated significantly with increased risk of more severe error outcomes. These included: insufficient training (n=32, P=0.008); working overtime (n=88, P=0.0016) and precepting a student (n=25, P=0.0004). In a more recent publication from the same study, the author found that the involvement of one or more of these factors tended to increase the severity of the outcomes of the medication errors (Sears et al., 2013). The generalisability of the findings in the study was limited because the three hospitals included are similar in terms of culture and staffing level.

Similarly, Özkan et al (2011) conducted a mixed method design study in a paediatric ward in a university hospital, Turkey (Özkan et al., 2011). The authors interviewed 25 paediatric nurses to explore the factors associated with medication administration errors. They also used an observation method to determine the frequency and the types of error. Errors were made in 36.5% of the 2,344 doses that were observed. Nurses identified workload, insufficient protocols, interruption, and lack of experience as contributing factors. The authors concluded that these factors were due to systems errors rather than individual errors.

Likewise, outcomes were reported in a non-experimental survey design study of 140 paediatric nurses conducted by Murphy and While (2012), who sought to describe the

contributing factors to medication administration errors. Workload stress and communication failure were reported by 78% and 71% of the staff respectively, as potential contributors. Interruptions were also cited by 86% of respondents. However, the small sample size in this study from just one hospital, as with the previous study, may limit the generalisability of the findings.

A confidential self-reporting questionnaire of 50 paediatric nurses in a Nigerian hospital asked nurses about their experience of medication administration mistakes during their career (Oshikoya et al., 2013). The authors found that 32 nurses (64%) admitted to having committed medication errors over the course of their career. Workload was reported by 26 nurses (52%) as the main reason for errors. However, as the questionnaire asked nurses about medication errors during their entire career, errors that occurred many years ago may have been forgotten and timeframe may introduce recall bias.

Nursing strategies to reduce medication administration errors

Two studies reported strategies to reduce medication administration errors from the nurse's perspectives (Alsulami et al. 2012; Chedoe et al., 2012). The first of these (the only systematic review included in this paper) was undertaken by Alsulami et al. (2012). Their aim was to evaluate the effectiveness of double-checking the administration of medicines. The authors identified 16 articles that met their inclusion criteria, with only one randomised controlled clinical trial (RCT), which showed a statistically significant reduction in the medication error rate. The other studies reported that there were some practical problems associated with the double-checking process. These involved staff shortage and emergency situations. The authors recommended that the process of double-checking medication prior to administration should be evaluated scientifically.

In the second study, the authors assessed the effectiveness of a multifaceted educational intervention on the incidence of medication preparation and administration errors in a neonatal intensive care unit (Chedoe et al., 2012). The intervention included teaching and self-study sessions on the preparation and administration of the drugs being commonly used in the unit. Using a prospective study design with pre and post-intervention measurement using direct observation, the authors found the incidence of errors

decreased from 49% (151 errors from 311 observations) to 31% (87 from 284). Although there was a clear reduction in numbers of error after implementation of the education intervention, alarmingly high numbers of errors continued to occur. The authors concluded that while an education session as an intervention reduces medication error rates, it is not sufficient on its own. Therefore, further innovative strategies are required to supplement this.

Families

Only two studies reported on medication administration error contributing factors from the family's perspective (Lemer et al., 2009; Walsh et al., 2011). These two studies identified a number of factors that increased medication error but failed to provide strategies to reduce medication administration error. No studies were found where families were involved in developing strategies.

Family contributing factors

In one study (Lemer et al., 2009) a prospective design was used to explore the effect of advice from healthcare professionals on medication safety in children aged 12 years and younger. The authors reviewed the medication charts and surveyed the parents of 1,685 paediatric patients. The data was collected between July 2002 and April 2003. The results demonstrated that the advice from both doctors and pharmacists was poor in quality and limited in provision of information. It was reported that healthcare professionals usually failed to offer medication information, and the majority of the families did not receive written information from the doctors (74.3%) or pharmacists (68.7%). The authors also found that the provision of this advice was necessary for this group as they were involved in the majority of the medication administration for children at home. It is not possible from the results of this study to identify whether advice from healthcare workers has significant influence or not on medication errors because of a number of limitations. First, the study was reliant upon the participants' memories of advice provision so may not have been accurate and may have introduced a recall bias. In addition, the authors collected neither copies of written advice given nor examples of conversations from either the doctor's office or the pharmacy; therefore, it

is difficult to assess the circumstances of these communications.

More recently, Walsh et al. (2011) found similar results, with medication errors often occurring due to communication failures between the doctor and the family and at home between family members, with doctors largely unaware of the problem. In their observational, retrospective study, carried out between November 2007 and April 2009, the authors visited 52 homes, reviewed 280 medication charts and directly observed medication administration techniques. They found 61 medication errors (21.7%), of which the majority were at the administration stage (51%). They also found that 95% of parents were not using support tools such as alarms or reminders, which resulted in 44% more medication errors compared with those using supports (P=0.0002). However, the Hawthorne effect may have influenced the results of the study by underestimating the error rate: research participants have been shown to alter their behaviour or performance because of their awareness of being a part of a study (Campbell et al., 1995).

Finally, no studies reported on strategies to reduce medication errors that included the families.

Discussion

Factors that contribute to medication administration errors were reported in the majority of the included studies, but few studies reported strategies to counteract these factors (see Table 2 for details). While the studies that aimed to identify these factors were consistent in their findings, the intervention studies that did consider error management had variable results and, where positive, they only outlined short-term benefits and failed to evaluate whether practice changes were sustained (Fortescue et al., 2003; Taylor et al., 2008; Morriss et al., 2009; Alsulami et al., 2012; Chedoe et al., 2012). The contributing factors to medication administration errors were mainly attributed to system process errors, rather than those made by individuals (Evans, 2009).

Contributing factors (increase	Studies (see Table 1)	Strategies (reduce errors)	Studies (see Table 1)
Increased workload (n=7)	4, 8, 9, 10, 11, 12, 13	Computerised prescribing (n=1)	5
Insufficient training (n=4)	8, 10, 11, 12	Educational intervention (n=1)	2
Non-adherence to policy (n=5)	3, 4, 8, 10, 13	Double-checking (n=1)	1
Failure in communication (n=3)	6, 8, 15	Barcoding (n=1)	7

Table 2 Contributing factors to increase and strategies to reduce medication errors

Educational interventions may be successful in reducing medication administration errors only when they are associated with other interventions, such as increasing staffing numbers and implementation of medication policies and guidelines. Future interventions to reduce errors should be comprehensive and include all personnel involved in the medication process (Otero et al., 2008). Similarly, the use of barcoding and computerised systems was found to decrease medication administration errors (Fortescue et al., 2003; Morriss et al., 2009). However, it was noted that a reliance on computer systems may lead to a reduction in human vigilance, resulting in nurses being less conscious of safety and unaware of medication administration errors (Evans, 2009).

Due to the limitations associated with strategies to reduce medication administration errors, specific attention to medication safety in the paediatric setting is necessary so that the risk is reduced. The process of double-checking the administration of medications is a recommended strategy for nurses.

However, this process fails to eliminate errors fully and there is a need for other medication safety procedures (Evans, 2009). Previous studies reported double-checking medications to be a labour-intensive procedure that requires two nurses and so increases workload – which itself has been shown to increase errors (Alsulami et al., 2012). Additionally, double-checking relies very much on human effort, thus the risk for errors remains high (Evans, 2009). Finally, having a ward-based pharmacist as a strategy to

reduce medication errors was not found to be scientifically proven and its effectiveness has not been verified (Fortescue et al., 2003).

The consequences of a poor workplace culture, such as a lack of communication and teamwork, have serious implications for patient outcomes (Manley et al., 2011). Such consequences have a direct influence on medication administration; for example, double-checking as a safety initiative will only succeed with effective communication and a strong sense of teamwork. Interventions to date have tended to focus on isolated components of the administration chain, such as improving the numeracy skills of nurses, rather than looking at how the culture influences practice and what might be done to improve it. A missing strategy, as identified in this review, is the role that parents assume as advocates for their children in medication management processes. Family involvement in the process has not previously explored how family members are supported and encouraged to be proactive in the health system, or the potential for them to be viewed as part of the medication safety agenda. Therefore, to change the workplace culture and to develop practice, the approach should not only be evidence-based; it needs to be inclusive of staff and families (and patients) and be adaptive to changing healthcare needs such as the transition of complex care into the community (Manley et al., 2011).
An important element of practice development is the use of the knowledge and skills of the personnel involved to provide good quality patient care (Gregory, 2012). To make a positive impact on people's lives requires a change in perceptions – encouraging involvement, developing new understandings and enabling choice (Christie et al., 2012). Person-centred approaches to practice are aimed at improving both quality and satisfaction, as they focus on the person thereby increasing feelings of satisfaction and wellbeing (Gregory, 2012). In the paediatric setting, person-centred approaches to care have been closely associated with family-centred models of care, which espouse inclusion of families in the child's care (Williams, 2006). Patient and public involvement is crucial to the delivery of appropriate, meaningful and safe healthcare (National Advisory Group on the Safety of Patients in England, 2013). However, for such a family-professional partnership to succeed, communication must be open, and decisions must be made together, with a willingness to negotiate care approaches as needed (Garling, 2008; Arango, 2011).

The centrality of the patient and their family in supporting a safety agenda has been highlighted in recent national and international reports on improving the safety of care for patients. The Garling report (2008) highlighted the importance of improving communication between healthcare professionals and patients. In the UK, the Berwick report (National Advisory Group on the Safety of Patients in England, 2013) extends the previous notion of 'patient' engagement to 'patient and their carer' involvement as part of the care pathway. Developing family-centred approaches has the potential to decrease medication errors, reduce death and disability, improve medication adherence, and help families to cope with the illness (WHO Global Forum for Government Chief Nursing and Midwifery Officers, 2012). A person-centred approach has long been advocated as a critical strategy in developing practice and optimising healthcare, albeit one that has so far been implemented in a limited way.

Family-centred care presents the continuum of children's healthcare and covers concepts of:

- Parental participation in children's healthcare
- Partnership and collaboration between the healthcare team and parents in decision-making
- Family-friendly environments that normalise as much as possible family performance within the healthcare setting care of children (Franck and Callery, 2004).

Family-centred care enhances the health and wellbeing of children and their families through a respectful family-professional partnership (Arango, 2011). It values the strengths, cultures, traditions and expertise that everyone brings to this relationship (Arango, 2011). It empowers families and fosters independence, which can increase the family's own activity and responsibility in relation to their child's illness and thereby contribute to better health and life satisfaction (Blomqvist et al., 2010). In the particular context of medication management, this suggests that providing substantial opportunities for parents to be involved in medication management while their child is in hospital is likely to influence their behaviours at home and result in more effective care in the community.

In this review, the role of the family in the medication administration process was unclear and while communication was identified as a factor contributing to errors, the exclusion of the family may be limiting the potential for improving medication administration practice. Previous literature (Yin et al., 2010; Basey et al., 2013) found that medication errors caused by family are preventable if the family is supported by the doctors, nurses and pharmacists prior to discharge (Yin et al., 2010). Basey et al. (2013), in another study of the medication process from family's perspective, found that although doctors knew the importance of obtaining an accurate medication history from the families and checking prescriptions with parents, they often failed to put this into practice, resulting in prescribing errors. However, the same study showed that the family was able to provide and discuss their child's medication in more detail than the doctors during admission to hospital.

Family involvement in delivering complex care has shown great success, with parents able to undertake roles such as tracheostomy care (Messineo et al., 1995), changing central line dressings (Rizzari et al., 1992), provide care to children on parenteral nutrition (Byrne et al., 1977) and providing stoma care (Gray et al., 2006). This suggests it is now time to move beyond an individual approach and consider the entire family as the client (Butcher, 1994). Why are families not being considered or included in the medication administration process or in developing future strategies to reduce medication administration errors? Indeed, if we are serious about reducing medication errors, it is vital that we take a person-centred approach that values the contribution of staff (nurses, pharmacists and doctors) and families, includes their perspectives and ideas and enables them to participate in developing a culture of medication safety.

Limitations

Several limitations to this review need to be acknowledged. The literature search did not include grey literature and used only four computerised databases and the reference list of the included studies. This may have resulted in a smaller sample for the review with the

potential for weakened conclusions. The small number of papers, using a wide range of methods, sample sizes and sites may limit the generalisability of the results (Pai et al., 2004).

It is recommended that the data evaluation stage should be conducted by two or more reviewers to code the individual studies for content and quality (Pai et al., 2004). However, the review of the literature was conducted by one individual (as part of his PhD candidacy). To minimise the effect of this, any uncertainty regarding a study was discussed with supervisors and consensus was achieved.

Implications for research

There is a need for well-designed studies to evaluate the ongoing effect of interventions to reduce medication administration errors. An additional consideration for the effectiveness of future interventions aimed at reducing medication administration errors must be the inclusion of families. The key focus of most studies included in this review is on a nursing perspective, with only two studies reported the parents' concerns and issues. Thus, there is a need for new studies to evaluate the involvement of families in the medication administration process as one possible solution for this complex problem.

Implications for practice

Many strategies were shown, in the short term, to be effective in reducing medication administration errors. However, errors continued to occur and remained significant in number. There is a need for multidimensional and innovative solutions to address this ongoing issue. Solutions need to take into account staffing levels, skill-mix, stress, workload, policies and guidelines, education support, the use of technologies and improved communication. The engagement of nurses, doctors, pharmacists and families in developing future strategies to reduce medication administration errors is vital.

Conclusion

This review highlighted agreement from a number of studies about the contributing factors to medication administration error rate. While there have been multiple attempts to improve medication administration safety reported in the studies in this review, sustainable solutions are not readily obvious. The strategies to reduce errors need to be more comprehensive and include all the key players including nurses, families and organisations. The family has been largely ignored as part of the solution, so the question remains; can the family be included in the medication administration process in order to reduce medication errors and associated harm?

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2.3 Engaging nurses in the change process

As stated earlier, this thesis focuses on one part of a larger project. The aims of this thesis are to explore the contributing factors of medication error from the nurses' perspectives, the nurses' role in the medication process and their ability to participate in medication safety research to improve medication safety. The reason for focusing on nurses in this research is their vital and essential role in the medication process and their closeness to patients while providing care. Reporting the parental engagement in research and the medication process is beyond the scope of this thesis. The findings related to this will be published by the broader research team.

As it has been recommended in the published literature review (in the previous section of this chapter), initiatives to reduce medication errors should include clinical bedside nurses and consider them as essential stakeholders to successfully reducing medication administration errors (Alomari et al. 2015). Therefore, to change medication practice and make it safer, the nurse's presence in the change process is vital for its success. In order to achieve the aim of this research, which is improving medication safety by reducing medication errors, nurses should be considered as the main player in the practice change (Afzali et al. 2014).

This section will summarise the relevant literature regarding the importance of engaging nurses in the change process, the barriers and facilitators to increasing nurses' acceptance of the change process, and theoretical and practical ways to engage nurses in the process. Additionally, a summary of the literature regarding engaging nurses in research as a method of change will be provided. To guarantee a successful and smooth change of the current medication practice, nurses need to be actively involved (Balfour & Clarke 2001). Change in this instance means to make a new practice or make the current one different (Balfour & Clarke 2001).

Although nurses make up the largest group of professionals working in the healthcare field, they are often left out of the decisions that shape changes in healthcare (Hamer & Cipriano 2013). Nurses often perceive that change is imposed upon them and that their views are not taken into consideration; this influences their commitment to the new change. In a Canadian qualitative study using semi-structured interviews with 65 nurses, the authors sought to explore the impact of healthcare re-structuring on nurses (Davidson et al. 2007). The results indicated that many nurses were not invited to participate in decisions related to healthcare re-structuring; others noted that when they did have an opportunity to participate, they were frequently not heard. Consequently, the perception of nurses being left out does little to empower them to own changes occurring and to adopt behaviours to sustain practice improvements (Bowers 2011). Improving the practice culture requires nurses to be involved and innovations to be maintained (Mitchell 2013). Therefore, to guarantee good engagement of nurses in the change process, it is necessary to understand how people might react to change (Heidarizadeh et al. 2017).

To understand the reaction of stakeholders to change, researchers should explore the barriers that may prevent people from accepting the changes (Shirey 2013). The biggest barrier to consider when implementing changes involved in a nursing innovation, such as medication safety, is overcoming stakeholder resistance (Balfour & Clarke 2001). The resistance to change is frequently associated with excluding stakeholders from the early stages of the change process. In this case, the stakeholders did not have a say in deciding what should be changed in their practice, which may cause a feeling of powerlessness (Smollan 2015). In a descriptive study conducted in an Australian hospital, the authors explored the ability of nurses to change their practice model from a patient allocation to a team-nursing model (Hayman, Wilkes & Cioffi 2008). They used multiple sources of data, such as observation, informal conversation with nurses, and meeting minutes. The nurses were resistant and expressed negative feelings about the new initiatives because they felt that the changes were imposed on them (Hayman, Wilkes & Cioffi 2008). The lack of consultation with nurses during the formal planning stage meant that nurses did not own the process, and they were critical of the new model and this may have caused them to be resistant to change.

The feelings and emotions of nurses toward the new practice may affect their acceptance of change. The fear of losing the current practice is viewed as a barrier to achieving successful change (Bozak 2003). Changes in the workplace naturally create uncertainty, can be emotionally challenging, undermine confidence, and threaten a sense of purpose for employees (Bowers 2011). In a longitudinal study, a questionnaire was administered to a group of nurses before and after their ward was moved to a new surgical department. Nurses were worried about the impact of the change on their practice and stated that the reason for feeling anxious about the new change was because the usual practice that they have been taking for granted had changed and they were not accustomed to the new one (Cavada et al. 2012). However, recognising negative feelings during the change process may give researchers and managers insight into the direction and development of support strategies for the affected nurses, which then will facilitate the change process.

Nurses need a convincing reason to increase their acceptance of the change, especially when the new practice is completely replacing the current one. For instance, people need to realise that change is necessary and valuable to the success of their organisation (Bozak 2003). Nurses need a clear justification of the change process, a sense of dissatisfaction with the present situation, a clear outline of what the problem is and the direction in which they intend to take (Balfour & Clarke 2001). In a recent qualitative study conducted in Australia, the researchers sought to understand how nurses perceive and describe the requirements to support the change process in their hospital. Fifty-one nurses participated in focus groups and semi-structured interviews (Laur et al. 2017). The authors found that nurses need a significant reason to accept the change and to completely change their current practices. However, merging the new change into the current practice is an alternative method to improve acceptance and support a successful change process (Laur et al. 2017). There is a need to enhance practitioner ownership, recognising and respecting the value and role of the nurse's knowledge base and allowing it to be integrated with the new practice.

Lack of involvement of nurses in the change process may result in many healthcare projects faltering or even ceasing (Plochg & Hamer 2012). For instance, despite the

current increase in technology in healthcare, Hamer and Cipriano (2013) believe that technology could be used even more in healthcare. They argue that the limited use of technology in healthcare is related to the lack of engagement of nurses in the change process (Hamer & Cipriano 2013). Similarly, Balfour and Clarke (2001) found that nurses need to be involved in health service change to achieve successful outcomes (Balfour & Clarke 2001). If nurses are not involved in the change process, resistance may occur, and nurses can reverse even the best-intended change projects (Bowers 2011). Generally, the lack of nursing engagement in healthcare decisions and medication process improvements has been a major barrier to healthcare improvements. Staff become resistant to the change and have a negative perception when the change is imposed on them (Hayman, Wilkes & Cioffi 2008).

In order to increase the acceptance of nurses as a condition for successful change, the literature highlights the role of healthcare organisations in supporting nurses to actively participate in the change process (Crozier, Moore & Kite 2012). All members of the multidisciplinary team should be involved when considering an alteration in practice (Balfour & Clarke 2001). The organisation should support a culture that encourages employees to suggest practice improvement ideas (Davidson & Brown 2014). By providing nurses with opportunities to voice their perspectives, nursing leaders can reduce power differentials among various professional groups, so that everyone can be sufficiently empowered to participate in the change process (Crozier, Moore & Kite 2012). Thus, it was advocated by Driscoll (1982) to use a 'bottom-up' approach when convincing people to alter practice, rather than a power-coercive strategy. 'Bottom-up' change is about convincing and involving people who are affected in the early stage of the change process, aiming for increasing acceptance and collective decision-making (Kezar 2013).

The organisations and change leaders should communicate the change process aim, intentions and the role of the stakeholders clearly (Moser & Ekstrom 2010). Effective communication will reduce, or even overcome, resistance to change in the organisation by reducing people's uncertainty of their future situation, and thereby create readiness for change (Catrin & Mats 2008). Communication among the participants in the change

process should reflect conversations captured in a dialogue mode rather than commands (Bernardes et al. 2015). Dialogue style communication in the change process refers to engaging the responsible parties in decision-making without privileging particular stakeholders because of their status or authority (Joseph 2012). Dialogue style communication provides stakeholders with a sense of equal partnership in the decision-making process, which then will empower them to make the decision. Thus, it is inherently a democratic processes that should substitute for top-down discourses, which are unfriendly to participatory practice (Raelin 2011).

A successful change process must be based on evidence and begin with an invitation to question practice (Davidson & Brown 2014). Successful change requires integration of research-based evidence with the practitioner's own knowledge. Change involves many complex issues and in order to be sustained must be continuous, cyclical and involve practice-focused research. Action research (AR) has these characteristics – it works through a cyclical process of planning, taking action, evaluating the action leading to further planning and so on (Froggatt & Hockley 2011).

Clinical bedside nurses and their practical knowledge can create evidence to inform the research basis of health and social care. Inherent in such research is the intention to change practice (Balfour & Clarke 2001). Research can be a tool for producing a change in organisations with workers' involvement (Cooper 2000). Lewin (1946) found that if employees took ownership of the work, they would become motivated to do their work. Research is a method that contributes to a sustainable reconceptualisation of nursing practice. Participatory research, such as AR, where nurses are provided with an opportunity to participate in the change process, voice their opinions and be well-supported as they work with other researchers and nursing leaders, is highly recommended (Evans & Hopkinson 2016). The AR approach and its relation to change is discussed in-depth in the methodology chapter.

To summarise, there was a consensus in the literature about involving nurses in the change process and considering them as key stakeholders when altering a practice in healthcare. However, there are many difficulties, or restraining forces, that may influence nurses to accept, adapt and own the change process outcomes. A well-formulated change plan will encourage adaptation to change rather than resistance. Clear change goals, careful planning, good communication skills, the involvement of those affected by the change, and support of nursing management are essential facilitators of change. Due to the requirement of the change process in healthcare to be cyclical and involve practice-focused research, AR was selected as the most appropriate method of change, and for engaging nurses within the research, as a key factor for successful change.

2.4 Engaging clinical nurses in research

The importance of considering nurses as key stakeholders, to engage them not only in medication safety research but in health research in general, has been highlighted in different statements from Australian health agencies (Australian Commission on Safety and Quality in Health Care 2010; Australian Nursing and Midwifery Federation 2015). The Australian College of Nursing [ACN] (2013) encourages nursing research to be a core part of all health research. The Australian Commission on Safety and Quality in Healthcare (2010) has stated that nursing research would reduce the risks and harm associated with the delivery of care. Consequently, this will contribute to the safety, quality and cost effectiveness of nursing care for individuals, groups and communities (Australian Nursing and Midwifery Federation 2015).

Nurses' participation in research increases their level of professionalism and gives them the opportunity to contribute to the body of nursing knowledge. This participation enables nurses to be active in applying research into practice (Syme & Stiles 2012). Engaging nurses in research is essential for the generation of nursing knowledge and is central to both the discipline of nursing, and the maintenance of healthcare services. Participation in research provides nurses with the opportunity to conduct personally meaningful research (Christie et al. 2012). Meaningful and worthy research refers to research that is

relevant to clinical practice and leads to significant change and improvement in real life (Pereira 2012). Meaningful research topics often emerge from disciplinary priorities and, therefore, are theoretically or conceptually convincing (Tracy 2010). Nurses will accept, participate in, and own research, as long as it directly influences their clinical life and improves their practice (Pereira 2012).

However, there is a perceived gap between theory and practice, and between researchers and clinical staff, that is often cited as the reason for research findings not being implemented efficiently in the workplace (Paramonczyk 2005). Strong links between research and clinical practice cannot be created if the researcher cannot meet the needs of the clinical staff (Chau, Lopez & Thompson 2008). A major challenge for putting evidence into practice is the degree to which the research is focused on issues that are directly relevant to practice (Vanderlinde & Braak 2010). Due to the lack of engagement of nurses in research, especially at their workplace, nurses may lose their research skills and knowledge they learned at university (Reed & Lawrence 2008).

Previous literature has shown that nurses consider research to be a valuable change method to improve their daily clinical practice. Different studies conducted with nurses in the USA (Smirnoff et al. 2007), Australia (Kerr, Woodruff & Kelly 2004), Scotland (Roxburgh 2006), and Finland (Kuuppelomäki & Tuomi 2005), have shown similar results where nurses, in general, have favourable attitudes toward research. However, these studies reflect mixed results regarding nurses' research participation. For example, less than 20% of respondents in the USA study had collaborated in conducting a study, whereas 60% of the Finnish respondents reported conducting research on their own, although only 3% had presented their findings at national conferences and only 1% had published them (Kuuppelomäki & Tuomi 2005). The current challenge for nursing leaders is to find a way to maximise the participation of nurses in research (Smirnoff et al. 2007).

There has been almost no change in the implementation of research by clinical nurses (Smirnoff et al. 2007) due to many situational and environmental barriers. An integrative literature review sought to explore the best practices for engaging clinical nursing staff in nursing research (Scala, Price & Day 2016). Nineteen papers were selected for review with the authors finding that the main challenges affecting research involvement were: a lack of access to infrastructure, different interests between the researcher and the nurses, and a deficiency of educational support. Likewise, a survey conducted in Australia found that nurses reported barriers including limited education and skills in research, scarce resources, and limited time to participate in research (Yates et al. 2002). In a more recent study, 458 nurses at an academic medical centre in the USA identified three barriers preventing them from engaging in research activities: insufficient time on the job to implement research findings or to read research, lack of nursing autonomy, and lack of awareness of research findings (Brown et al. 2009). The authors also found that higher perceived barriers related to availability and understanding of research were associated with lower engagement rates in research. These findings were consistent with those of Hutchinson and Johnston (2006), who also identified a lack of awareness of available research literature and insufficient authority to change practice as important barriers in a hospital setting. More recently, in a review of studies using the Barriers to Research Utilization Scale, a perceived lack of authority to change practice, inadequate facilities, lack of cooperation from management or physicians, and lack of time to read research, were among commonly reported barriers to nurses engagement in research (Hutchinson & Johnston 2006).

Providing nurses with the opportunity to participate in research projects and having continuous exposure to the research process can be a successful strategy when considering how to encourage new researchers (Sawatzky-Dickson & Clarke 2008). Healthcare organisations need to adopt the principle of encouraging, facilitating and fostering nurse's participation in research-related activities. Interventions undertaken by these organisations must be clearly relevant to the nurses' current clinical practice (Paramonczyk 2005). Encouraging involvement, developing new understandings and enabling choice are required to increase nurses' engagement in research (Christie et al. 2012). Formal nursing engagement in research means active participation in every step

of the research process: research planning, data collection and analysis (Crozier, Moore & Kite 2012). This will, in turn, enhance the sustainability of research findings (Hines, Ramsbotham & Coyer 2015).

2.5 Conclusion

Medication error is a complex problem and needs to include all the stakeholders to participate in minimising this issue. However, patients, families and nurses have limited involvement as key stakeholders in the medication process. Similarly, the voice of clinical nurses, who are the frontline workers in patient care, has not been heard or recognised in the change process or in medication safety research. It is important to engage bedside nurses as key stakeholders in the medication safety agenda, ensuring that they can share ideas on how medication errors can be reduced. This approach would benefit the 'working with' nurses rather than 'working on' nurses, to develop ideas for enhancing medication safety and reducing medication errors (Bowers 2011).

Previous literature confirmed that nurses' positive attitudes toward research are in contradiction with their actual involvement in research activities. To achieve a sustainable, successful and evidence-based change process, there is a need to enhance nurses' ownership, recognising the value and role of their knowledge, and allowing it to be integrated with research-based knowledge. The most expedient way to enable nurses to challenge traditional practice is to involve them in the change process (Jacobson et al. 2008). This could be achieved through the use of a participatory approach, which explicitly seeks and works with the knowledge of nurses in a facilitatory way (Evans & Hopkinson 2016). The next chapter outlines methodological and ethical considerations for this study, highlights the study design, conceptual framework, and the methods used in undertaking this study.

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Chapter 3 The Methodology

3.1 Introduction

The literature review in the previous chapter reported that while there have been multiple attempts to improve medication administration safety, sustainable solutions are not readily obvious. The strategies to reduce errors need to be more comprehensive and include nurses, families (or patients) and organisations. More specifically, the literature summary reported that to improve medication practice, nurses need to be engaged as key stakeholders in future research. However, lack of opportunities in engaging nurses in research still exists.

This project will involve clinical bedside nurses in an Action Research Team (ART), as part of a broader team of researchers to improve medication practice in a paediatric complex care ward. More specifically, by engaging nurses in the ART the study aims to:

1. Identify the barriers and facilitators to safe medication practice,
2. Develop and implement targeted interventions to reduce medication errors,
3. Evaluate targeted interventions developed by nurses to improve medication safety, and
4. Understand how nurses engage in research and lead a change in practice.

Overall, the aim of this research is to engage nurses in an ART, to examine data about current medication practice, and to develop, implement and evaluate targeted interventions to reduce medication errors. Firstly, the research aims to explore and challenge the current medication culture and practice of nurses, by disclosing underlying values to practice, and illuminating contradictions and taken for granted assumptions, in the everyday reality of practice. To enable and encourage nurses to engage in this work, a comprehensive description of their medication practice needs to be obtained (Fulton 1997). By highlighting that medication administration errors are an issue on the ward, the project aims to change a nurse's way of thinking and culture, and motivate them to come up with new ideas from their own experience to reduce medication errors. This could be

achieved by liberating nurses from constraints, which include dysfunctional conditions in organisations, cultures and structures (Fay 1987). Such conditions may include: limited time to conduct research, lack of education support, availability of funding to support nurses, and negative feelings about research (Casey, O' Leary & Coghlan 2018). Engaging nurses in this project may facilitate the development and implementation of initiatives to improve medication safety. Also, nursing engagement may result in more sustained outcomes, due to the nurse's actual presence in the research setting (clinical unit) after the research finishes.

This chapter outlines the research approach and theoretical underpinnings of the study, outlining the reason for choosing this research framework. The study design and methodology will then be described, including the setting, participants, data collection procedures, data analysis and management. My position as a PhD candidate in the ART will be discussed. Ethical issues are also presented in this chapter.

The overall aim of this large multidisciplinary collaborative study was to recruit nurses and families in an ART, with the intention of reducing medication administration errors in the paediatric inpatient setting. This thesis is focusing on the nurses' participation. Aspects of the study relating to engaging the parents is not part of this thesis, and will be reported by the broader research team. I will discuss my role and highlight the aspects of the study that I managed.

3.2Theoretical framework

Empowering nurses to accept, adapt and own new medication practice is desirable in this study (McCarthy & Freeman 2008). Therefore, a research approach that is consistent with empowerment, was required. Critical Social Science (CSS) underpins this research and forms a basis for enabling, supporting and empowering clinical nurses to drive change in their own practice.

The view that medication practice change requires a change of attitude, knowledge and behaviour of the nurses, and that the research outcomes are very likely to be sustained when there is collaboration and inclusion of stakeholders in the change process, was also embraced. Therefore, understanding the human aspect of the change process is desirable (Shirey 2013). Lewin's Theory of Planned Behaviour (LTPB) is used as the theoretical framework for this research.

CSS and LTPB are concerned with the process of change, through collaboration and participation with those who will be affected by the change. A detailed discussion of these frameworks and the key constructs within each of these approaches is presented.

3.2.1 Critical Social Science

Critical Social Science (CSS) underpins this study, as this approach enables participants to develop a self-critical understanding of practice, and supports participants to create as well as translate knowledge into practice (Titchen & Manley 2006).

CSS originated from the Frankfurt School in Germany in the 1920s. It was inspired by critical Marxist philosophy and Hegelian dialectics, both of which leaned heavily on contradiction, change and movement (Kuokkanen & Leino-Kilpi 2000). CSS has also been influenced by the liberation movements, such as feminism and the revolutionary thinking of those working with underprivileged and dispossessed people throughout the world (Corbett, Francis & Chapman 2007).

This theoretical framework is based on emancipating people from the restraints of an unjust life imposed upon them by social dominance (Carr & Kemmis 2003). It considers that the empowerment of underprivileged people would lead to a transformative awareness, which is the catalyst for action (McCarthy 1981). In CSS, underprivileged groups are commonly described by the term of oppressed groups. Oppression is

maintained by social institutions and administrations. Oppressed groups may include ethnic groups, homosexuals, immigrants, women and patients (Kuokkanen & Leino-Kilpi 2000).

Nurses have been described as an oppressed group, as they do not have the power to independently make decisions regarding practice (Lakdizaji et al. 2010). Nurses are viewed as "following" orders and instructions without thinking about them. This historical metaphor has two sides, where nurses have to follow doctors and, in recent days, following practice policy without any authority to discuss or negotiate that. This may inhibit nurses' self-perception as autonomous and self-determining professionals, and they have adapted their behaviour accordingly (Casey, Saunders & O'Hara 2010). In the past, during training, nurses were pressured to follow doctors (Kuhse 1997):

"Loyalty is the first essential…your training and the lectures you receive are given so that you can intelligently cooperate with the doctor in the treatment of the patient. The little knowledge you will have gained during your years in hospital in no way fits you to diagnose disease or to prescribe treatment, nor does it place you in a position to criticize the doctor or his methods" (Kuhse 1997, p. 25).

More recently, clinical bedside nurses are often not engaged in writing the policies and practice guidelines they are then meant to follow (Lakdizaji et al. 2010). Often clinical policies and guidelines are developed by committee members who are not current practising clinicians, without the active engagement of nurses in the policy development process (Porritt 2007). In contrast, clinical bedside nurses must follow these policies and do not have the power to change them or to participate in decision-making about them (Rycroft-Malone et al. 2008). This lack of engagement in clinical policy development has been widely expressed by nurses. As a result, clinical nurses perceive these policies as a tool to follow which, in turn, may oppress their critical thinking (Lakdizaji et al. 2010). Clinical policies may suppress decision-making among nurses and obscure their competency, if these policies do not take nurses' opinions into consideration when being devised. In addition, these policies might include impractical or non-feasible instructions

and increase the burden of work on nurses. This may lead nurses to feel oppressed about an aspect of their practice, such as how they can influence changes in medication practice.

The application of CSS is to create a situation whereby oppressed people can act in a more satisfying way, through analysing a social situation that is causing them suffering and replace it with a better one (Fay 1987). The use of CSS in the context of nursing emphasises the concept of empowering nurses as an oppressed group, in order for them to improve practice and change their social situations (Casey, Saunders & O'Hara 2010). CSS can provide insight into analysing the practice that is causing nurses' dissatisfaction and improve it, by challenging the current practice and reframing it to make it safer and more satisfying (Lieshout 2013).

The practical intent of CSS is achieved through the process of enlightenment, empowerment and emancipation (Fay 1987). Enlightenment of any society comes from raising the consciousness of society and increasing their awareness about their false or incoherent practice (Fay 1987). To achieve this first aspect of CSS, the enlightenment of stakeholders, researchers need to work collaboratively with individuals to develop alternate ways of understanding themselves and their social context (Manias & Street 2000). As stated earlier, this project aims to explore the current medication practice and culture in the study setting. To achieve this aim, the CSS approach will raise the awareness of the nurses about any flaws and inconsistencies that exist and the taken for granted assumptions about their practice they may have held for a long time. This 'consciousness raising' empowers the social group to change (Fay 1987). However, enlightenment by itself is not enough for individuals to become liberated from a social order (Manias & Street 2000), there must be more done than merely raising awareness of the realities of everyday practice. Increasing the awareness of individuals will enhance their understanding of their current situation, which will encourage people to take action for change (Corbett, Francis & Chapman 2007).

An early aim of the CSS is to provide an environment in which individuals could become empowered in their struggle for self-emancipation (Manias & Street 2000). Empowering people can be achieved by challenging and reframing established practice (Fay 1987). As stated earlier, nurses appear powerless to change the issues surrounding their medication practice policy and guidelines. The decision for managing medication practice comes from different committees and decision-makers, with nurses not usually involved in these decisions. For example, hospital policy is written and endorsed by a hospital committee. Clinical bedside nurses do not have any considerable degree of involvement in decisions to update or change the policies such as medication policy. Thus, the nurses may believe that they are unable to change the rules concerning medications, such as administration times because, as stated in the introduction chapter (page 22), the nurses must follow a standardised medication chart where the medication times are pre-set for nurses to follow. Providing nurses with an opportunity to participate in the decisions surrounding medication practice and engaging them as partners and stakeholders will support them to improve their own medication practice (MacDonald 2012). The key tools which help to generate power within nurses are the creation of opportunities, effective information, and support at each level of the organisation (Kuokkanen & Leino-Kilpi 2000).

Empowerment has been conceptualised in terms of freedom; freedom to make a decision with authority to change practice and have choices (Fulton 1997). The knowledge about the flaws in practice occur when nurses become enlightened about their practice and their ability to change or improve it (Lakdizaji et al. 2010). In this project, the aim is that when nurses become enlightened by raising their consciousness of their current medication practice, this will increase their awareness about their everyday practice and how this relates to requirements for safe medication practice.

After raising nurses' awareness about their practice, nurses will be empowered to ask critical questions, therefore enabling them to build confidence in their own ability to improve their practice. Empowerment in this context relates to nurses' ability to influence their medication practices (Glasson, Chang & Bidewell 2008). Nurses should be empowered to use change processes to improve their workplace effectiveness, because

they will be the first to see the benefits for their patients (Glasson, Chang & Bidewell 2008). This empowerment can emancipate nurses and liberate them to improve their practice through research (Fay 1987).

Emancipation is the goal of empowerment, through which new practices replace oppressive ones, allowing individuals to relate and act in more satisfying ways (Casey, Saunders & O'Hara 2010). Therefore, by engaging nurses in the decision to improve medication practice, they will have the freedom to think clearly about safety mechanisms for medication practice and to challenge their current practice. Emancipation means that nurses can then lead a revolutionary activity, in which constraints and barriers to improve their medication practice are overthrown. This will, in turn, improve their working conditions, their satisfaction, and patient care safety.

The AR movement draws on critical social theory and critical social science (McCarthy 1981). AR draws on the practice value of knowledge development, seeks to empower individuals, and to facilitate change in the social context (Titchen 2015). AR aims to examine the political structures that disempower oppressed groups of people and to find ways in which these structures can be changed (MacDonald 2012). As such, AR aims to create a new form of knowledge through creative synthesis of the different understandings and experiences of those who take part, with an aim to change the situation of the oppressed people.

3.2.2 Lewin's Theory of Planned Behaviour (LTPB)

Lewin's Theory of Planned Behaviour (LTPB) provides an integrated approach to analysing, understanding and bringing about change at the group, organisational and societal levels (Burnes 2004). The structure and processes of LTPB assist in avoiding the common pitfalls that prevent change initiative success and offer a framework to guide change (Shirey 2013). LTPB was identified as a strategic resource to mobilise the human capital aspect of change (Shirey 2013). LTPB together with AR form an integrated

approach to analysing, understanding and bringing about a change to a group (Burnes 2004). This is achieved by identifying the forces of the group, to understand why group members behave in the way they do when subjected to these forces (Burnes 2004).

Lewin believed "*that if one could identify, plot and establish the potency of (driving and restraining) forces, then it would be possible not to only understand why individuals, groups and organisations act as they do, but also what forces would need to be diminished or strengthened to bring about change."* (Burnes 2004, p. 311).

Lewin argued that a successful change must involve three stages (Lewin 1951). The *unfreezing* stage requires a change agent, such as nurses, recognising a problem, identifying the need for change (Heidarizadeh et al. 2017). The stage begins with nurses conducting a gap analysis illustrating discrepancies between the desired and current practice, to create a sense of urgency for change (Manchester et al. 2014). The study could achieve this through the multiple data collection in Phase One. For instance, identifying the medication error rate on their ward and comparing it to the organisation's rate may enlighten the nurses about the real picture of the problem and then create a sense of urgency among them. Recognising the need for the change is congruent with the enlightenment principle of CSS theory, where there is an increased awareness by stakeholders about the current situation and the need for change (McCormack & Titchen 2006). During Phase One of this study, the researcher aims to identify the barriers (restraining forces) and facilitators (driving forces) to improving medication practice, with the aim to increase nurses' awareness of their current practice culture and identify the need for change.

Transitioning is the second stage of Lewin's theory and represents the movement that individuals make in reaction to change, and requires unfreezing or moving to a new way of being (Shirey 2013). This stage requires a detailed plan of action and engaging nurses to try out the proposed change. The first aim of this study is to improve the medication practice and culture through engaging the nurses as primary stakeholders in this change process. This aim could be achieved in Phases Two and Three, where nurses will be engaged in an ART to create an action plan and implement interventions to change their

medication practice. This stage is consistent with empowering and the emancipation principles of CSS, where people should be motivated to take action to improve their current situation (McCormack & Titchen 2006). This AR will support nurses to participate, voice their perceptions and opinions about their practice, and enable them to take action to improve their own practice.

The third stage is the *refreezing*, which demands stabilising the change so that it becomes embedded into existing systems, such as culture, policies, and practices (Manchester et al. 2014). This stage is important because locking in change will be crucial to its sustainability over time (Shirey 2013). In this research, giving the nurses the opportunity to engage in the research team would present a learning opportunity to enhance their research knowledge and skills, and to maintain the outcomes after the research finishes. This aim could be achieved through increasing their awareness, educating them, engaging them, and motivating them to maintain the change. Their participation in this research may build their research capacity, at the same time as increasing their awareness about the importance of maintaining the safe practice.

In Lewin's theory, there are two forces that influence a change process: driving forces and restraining forces (Lewin 1951). Driving forces might be the result of external forces compelling the change or simply the desire to improve a situation (Bozak 2003). On the other hand, restraining forces can prevent a change from occurring by creating barriers, such as concerns that a project will fail, or the fear of losing the current practice (Shirey 2013). To achieve successful change, the driving forces must be strengthened in favour of the change while the restraining forces are weakened or eliminated (Lewin 1951). The barriers and facilitators of medication safety in this study will be explored in Phase One. These factors (forces) will be identified by using multiple data collection (quantitative and qualitative) by different researchers and over a prolonged period of time (i.e. 3 years).

Figure 3.1 shows the integration of both theories in relation to the different phases of this research. Phase One of this study will aim to unfreeze the nurses and enlighten them about

their medication practice. Phase Two of the study aims to empower the nurses to take action and move to a new way of action (transition) by implementing the changes to improve their practice. Phase Three of the study aims to establish a new way of practice (emancipation) and sustain the positive changes on their ward (refreezing).

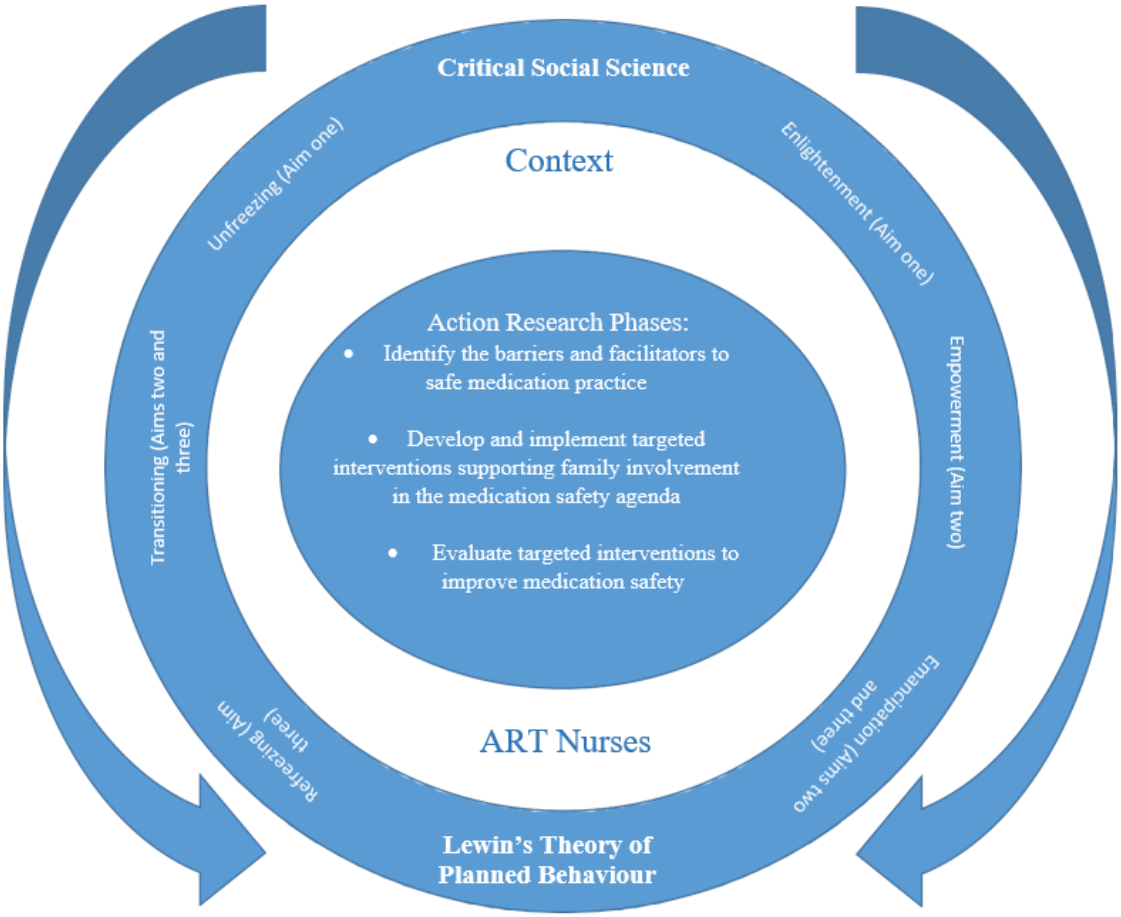


Figure 3-1 Theoretical Framework

3.3 Action research

The project design and methodological considerations have been underpinned by the philosophical premises of AR. This section will provide a brief description of AR history, its definition, strengths and forms.

3.3.1 Brief history of action research

Traditionally, AR was developed in the 1940s as a tool for producing a change in organisations with workers' involvement (Cooper 2000). Kurt Lewin is described as the founder of AR (Hart & Bond 1995). Lewin studied how people could enable themselves to improve their social situation through self-education, and identifying obstacles and alternative solutions to deal with the situation (Lewin 1946). In his AR study, Lewin (1946) found that if employees took ownership of the work, they would become motivated to do their work. Hence, the position of the participants in AR, who are expected to actively contribute to the research, may be different to the participants in other research approaches where they take a more passive role. This participative characteristic became one of the main features of AR (Titchen 2015).

Paulo Freire is recognised as a pioneer of the development of AR (MacDonald 2012). Freire was an author of critical works of pedagogy and challenged the relationships that were based on social dominance and power (Corbett, Francis & Chapman 2007). Freire's work in AR was based on empowering the poor and marginalised members of society about issues relating to literacy, land reform analysis, and the community (Freire 1970).

AR has also developed from movements that shared a vision of free society (Liamputtong 2009). For instance, feminism extended participatory research by analysing power differences on the basis of gender (Liamputtong 2009). AR was linked to the following ideas, 1) the view of adult education as an empowering alternative to traditional approaches to education, and 2) the ongoing debate within the social sciences over the dominant social science paradigm (MacDonald 2012).

Originally, AR focused on social action and change (Manias & Street 2000). Today, AR aims have expanded and are directed at encouraging practitioner problem solving (Bensimon et al. 2004) and generating or testing theory (Titchen 2015; Titchen & Binnie 1993). Nurses are the first among health professionals who have used AR (Titchen 2015) to improve the quality of care by effectively bridging the gap between nursing theory and practice (Hart & Bond 1995).

Action research (AR) is defined as;

*"A period of inquiry that describes, interprets and explains social situations while executing a change intervention aimed at improvement and involvement. It is problem-focused, content specific and future-oriented. Action research is a group activity with an explicit critical value basis and is founded on a partnership between action researchers and participants, all of whom are involved in the change process. The participatory process is educative and empowering, involving a dynamic approach in which problem identification, planning, action and evaluation are linked" (*Waterman et al. 2001, p. 11).

The length of this study is three years and aims to describe the current medication situation, interpret the data through reflection and critical thinking, and to develop interventions according to the findings of Phase One – to improve the medication practice. This research is problem-focused because it depends on describing and understanding the context and practice of medication activities in Phase One, through multiple data collection methods. The study is future-oriented because it is about achieving a vision, by striving to improve medication practice in the future. The critical value in this study was achieved through critical analysis of the data about the suitability of the proposed interventions, within a group of nurses and researchers who work in partnership within an AR team. The change in this study is evolving and continuous, and is considered a dynamic approach because of utilising the cyclical approach of AR. This is achieved through the multiple phases of this study, which include gathering evidence, and critiquing and reflecting on the findings to evaluate the change process. Active involvement of nurses as partners in this project aims to empower and educate them,

teaching them how to identify their practice issues, plan, and implement changes through an action plan.

AR is a democratic process essentially aimed at both taking action and creating knowledge or theory about the action. The aim of the democratic and participatory elements of AR is to make the research a collaborative venture, rather than one that involves scientists doing research for and about practitioners, and then formulating their findings into sets of recommendations (Reed 2005). To reach utility of the AR, the participants should be involved in the entire research process, from defining the research question to implementation and evaluation (Blomqvist et al. 2010).

In AR, the researchers and participants work together through different stages of the research process, from problem formulation to project evaluation (Blomqvist et al. 2010). Researchers attempt to address any inequities between themselves and the participants through a focus on negotiation and understanding the views of others, in an effort to create equal forms of interaction (Titchen 2015). More significantly, in AR, participants are viewed as being central to the process of doing research as a collective group. As a result, these research methodologies provide a forum for consciousness raising (as in CSS and LTPB) for nurses to understand and restructure their clinical practices (MacDonald 2012). Consciousness raising increases the understanding of nurses about their current situation or problems, and identifies barriers and facilitators, with the aim to redress contradictions, oppressions or domination and to challenge established practices (McCormack & Titchen 2006).

The philosophical framework of AR is informed by CSS theory. The AR process is empowering and liberating for individuals, as it provides critical understanding and reflection of social issues (Minkler 2000). The practical aim of CSS is achieved through *enlightenment, empowerment* and *emancipation*, and these are linked to the goals of the AR research (Balakrishnan & Claiborne 2017) and are present within this study. The influence of CSS theory has been an important feature of AR, in both theory and practice,

because the theory argues that meaningful human knowledge must not merely understand the world but also change it (Corbett, Francis & Chapman 2007).

One aim of AR is raising critical awareness among participants from all backgrounds through dialogue (Balakrishnan & Claiborne 2017). AR focuses on linking the process of knowing, to learning and action, which leads to the development of critical awareness about the world participants live in (Liamputtong 2009). Engaging nurses and researchers is a joint process, in which both contribute equally with the aim to provide a co-learning process to increase their awareness about the lived situation (Minkler 2000). The collaboration of researchers and nurses in AR, using their diverse knowledge, skills, and expertise, fosters the sharing of knowledge development (Coughlan & Coghlan 2002). Individuals learn by doing, which strengthens their belief in their abilities and resources, as well as further develops their skills in collecting, analysing and utilising information (Corbett, Francis & Chapman 2007). This process is believed to *enlighten* ordinary people by enabling them to recognise the need for change (*unfreezing*) and assist them to change their lived situation and challenge traditional boundaries (Reed 2005). AR aims to encourage those who are normally excluded from the change process, such as nurses, by providing them with a participation opportunity in AR, with the aim to enlighten them about their current practice (Liamputtong 2009). In this study, after engaging the nurses in the AR team, the research design will enable the research nurses to describe, interpret and explore the barriers and facilitators of safe medication practice with a view to change the current practice culture. Enlightenment, as outlined in CSS, and unfreezing, according to LTPB, can be achieved in this study by creating greater awareness of the current situation for the AR participants (Balakrishnan & Claiborne 2017), and this will highlight the need for change. The enlightenment of participants in this research is key in the first phase, which is aimed at identifying the barriers and facilitators of medication error. The enlightenment results from the learning opportunities in AR and may lead to enabling participants to give a voice to topics that are important to them.

Once awareness is achieved, the participants in AR should be able to challenge the causes of their perceived oppression, or resolve the suffering that is endured, if that is what they

hope to achieve (Balakrishnan & Claiborne 2017). The education opportunity resulting from raising awareness through AR will *empower* participants to change their current situation (Corbett, Francis & Chapman 2007) moving them to a new way of action (*Transitioning*) (Manchester et al. 2014). Enlightening the nurses about the flaws of their medication practice is useful, to empower them in the process of constructing their own knowledge (Reed 2005). This can be explained by the fact that in the tradition of AR, involving people in the research process empowers them to work for change in practice (Blomqvist et al. 2010). AR empowers nurses by providing them with the opportunity to plan for the change (Balakrishnan & Claiborne 2017), for example in this study, to implement the interventions required to improve their current medication practice and evaluate these interventions. These changes enable participants in AR to lead to a reconstruction of the meaning of a particular practice situation, and enable understanding and a sense of clarity of what might be possible.

Emancipation in CSS can be achieved through AR by reaching a more human position, where ordinary people have the freedom both to make their own choices and to take action that is suitable for them (Blomqvist et al. 2010). Emancipatory knowledge is concerned with social structures and enables the critical examination of existing rules, habits, traditions and ideologies (Reed 2005). The aim of this research is to liberate nurses from constraints or restraining forces (that may be identified in Phase One) and enabling them to see the possibilities for improving their medication practice. AR is liberating, in that it provides freedom from oppressive factors such as lack of resources (Balakrishnan & Claiborne 2017). Engaging and empowering the nurses in this AR may assist in building the research capacity of nurses, so they can maintain the positive aspect of the new practice and the positive changes on their ward (*refreezing*).

3.3.2 The strengths of action research

AR is one research approach that can be readily adopted by healthcare providers concerned with improving the quality of care and service delivery (Blomqvist et al. 2010). The appeal of AR lies in its ability to bridge the gap between theory, research, practice and scientific methods (Reed 2005). AR is an excellent approach when practitioners are

interested in investigating their own practices (Coyne et al. 2011). As stated earlier, the intent of this study was to engage clinical bedside nurses as the participants, for whom the change in practice has a direct impact. AR is an appropriate methodology for this project because of the transformational nature of the study, and the need for clinical staff to be collaborators instead of subjects of proposed interventions (Reed 2005).

AR is a suitable approach for issues of organisational concern, such as patient care safety, systems improvement, organisational learning and the management of change (Coughlan & Coghlan 2002). The anticipated outcome of this project is organisation and system improvements, by improving organisational and individual learning about medication practice. AR is being used in a variety of health and education settings to effect change (Titchen 2015). AR assists in understanding and addressing complex problems, or facilitating the development of relevant and appropriate practices, services and organisational structures (Leitch & Day 2000). The cyclic process of AR makes it most appropriate to the needs of organisations wishing to drive change within their environment (Peek 2015). Additionally, AR can contribute to the development of theory about what really occurs in hospitals and to the development of nursing knowledge (Blomqvist et al. 2010). This study will take place in one institution; this condition makes it applicable to one of the characteristics of AR, that is, to deal with a particular problem in a small population (Coughlan & Coghlan 2002).

AR assists nurses to reflect on their practice. Reflection is considered as a process or activity that is central to developing practices (Leitch & Day 2000). Reflective practice is an integral component of the AR process, focusing on participants' own meanings and interpretations of the process and its impact and outcomes (Badger 2000). Reflective practice in AR acts as a method to increase participants' level of control over change and the intervention they need to implement (Leykum et al. 2009). Reflection assists practitioners in identifying explicit fundamental problems, by raising their collective consciousness. Nurses, who are the participants in this study, will be provided with an opportunity to reflect on their own practice in their own context, and will identify and explore issues that affect them, or which can be affected by them, and will develop

interventions to address medication administration errors. This reflection will contribute to enlighten the nurses about the flaws in their practice (Titchen 2015). The researcher and nurses' reflections on the process of AR is crucial to enhancing their research (Peek 2015).

3.3.3 How it works

AR works through a cyclical process of consciously and deliberately planning, taking action, evaluating the action and leading to further planning and so on (Froggatt & Hockley 2011). The intended change in an AR project typically involves changing patterns of thinking and action that are presently well established in individuals and groups (Coughlan & Coghlan 2002). In this study, the medication administration culture has existed and already been implemented for a long time. AR, in turn, aims to explore the culture by challenging the assumptions about practice that nurses take for granted and changing their thinking and actions in order to improve their medication practice.

The effectiveness of the change resulting from AR depends on participation and involvement of participants in fact-finding and engagement in new kinds of action, to solve a specific problem such as medication safety (Blomqvist et al. 2010). Where issues persist, or new ones are identified during the research phase, AR creates opportunities for participants to re-enter the research cycle repeatedly, until the optimal patient care outcomes are achieved.

3.3.4 Forms of action research

There are three forms of AR approaches: **Practical**, **Technical** and **Emancipatory** (Carr & Kemmis 2003). In general, all three forms of AR are similar in terms of their general aim that focuses on changes to improve practice. The differences between these approaches are based on the generating of the research problem and the implementation of the interventions.

In ***Practical AR***, the research problem is generated by the participants (Grundy 1982), which gives them the power to lead the research. The researcher, who is acting as a consultant, must ensure participation of the AR participants during the AR process (Titchen 2015). In Practical AR, the researcher helps practitioners to learn about becoming self-reflectors and taking responsibility for this reflection, as well as taking joint responsibility for collective reflection (Titchen & Manley 2006). Medication error has been identified as an issue at national and international levels, and this research comes in response to this identified need. Participants (nurses) did not directly participate in raising the questions of this research, therefore, Practical AR is not the driver in this research.

The ideas generation in ***Technical AR*** generally comes from the researcher, who plans the action, and the interventions are implemented by participants (Carr & Kemmis 2003). The main weakness of this approach is the lack of participation of the stakeholders in the research process. While this approach results in an efficient change in practice, the enthusiasm of the participants frequently decreases and old practices gradually re-emerge, limiting the long-term effectiveness of the intervention (Holter & Schwartzbarcott 1993). The researcher's role is more aligned to that of a consultant assisting the practitioners to improve their practice. A technical approach is not suitable for the aims of the research reported here, as outlined earlier in the literature review; the voice of nurses is key to developing effective solutions to long-term problems, such as medication administration errors. What is required is the active engagement of nurses in all stages of the research, and taking a technical approach would not help achieve nurses' engagement. Nurses in this study will be asked to participate in developing, implementing and evaluating the required interventions to reduce medication errors on their ward.

The focus of ***Emancipatory AR*** is improving practice through engaging participants in critical reflections. While the idea of this research was based on national and international data of medication errors, the medication administration error data were generated by the researchers in Phase One, then used with engaged nurses in the research process to elicit their thoughts, thereby, raising awareness. The researchers raised questions about the

underlying assumptions and values, and involved the practitioners in critically reflecting on their practice and bringing to light the difference between stated practices, underlying assumptions, and unwritten laws that really govern that practice (Holter & Schwartzbarcott 1993). The aim of this research study matches the focus of this type of AR. This research aims to engage nurses and encourage them to reflect and challenge their own medication practice.

The AR approach of this project is considered emancipatory and focuses on the practice of nurses and empowering them, by enhancing their understanding and ability to challenge their workplace culture and context. The nurses were invited to be involved in this research as both participants and researchers. Nurses were recruited to be part of the research team with the intent that they would be supported to drive the research cycle (empowerment) and implement the change (emancipation). My role in this research was to guide and advise the nurses. The aim here being that the nurses, in turn, would learn the research skills they require, to continue in developing their own practice after the research finishes. It was anticipated that as the collaboration between the nurses and other researchers strengthened, the nurses would take more ownership of the research and drive the subsequent changes in practice.

3.4 Study design

The project used an AR process, implementing three study phases over a three-year period. Table 3-1 shows the different phases and the timeline of this research. AR was selected as this approach to enable a participatory, democratic process to engage participants to improve their own practice. AR has built-in evaluation mechanisms creating opportunities for participants to re-enter the research cycle repeatedly until the optimal patient care outcomes are achieved.

Phase	Aim of Research	Timeframe
1	Identify the barriers and facilitators to safe medication practice	Jul-Dec 2014
2	Develop and implement targeted interventions supporting family involvement in the medication safety agenda	Mar-Nov 2015
3	Evaluate targeted interventions to improve medication safety	Dec 2015 - Dec 2016

Table 3-1 Action research phases timelines

The three phases were embedded within an AR cycle (Figure 3-2) to enable participants to engage in cycles of inquiry, to transform real-world environments and to address context specific problems, such as medication safety (Somekh 1989). The AR process is presented as a cycle of problem identification or situational analysis (including reflection), planning, action (implementation of change and monitoring), and evaluation, which may lead to identification of new problems, planning, action and evaluation, and so on.

Figure 3-2 Action research cycle (Somekh 1989)

The AR process begins with reflection on the current situation in order to gain an understanding of the problem and the generation of the research questions. Identifying and investigating the problem is a key step from which change or improvement strategies may be generated (Titchen 2015). These are presented in steps one, two and three of the AR cycle. In this research, the aim of Phase One was to identify and explore the safety culture on the ward and investigate flaws in practice. The aim of Phase Two of this research, which represents steps four and five in the AR cycle, was to plan, develop and

implement targeted interventions to reduce medication errors. This plan was supported by recruiting nurses to the ART (Waterman et al. 2001). These actions were then evaluated through different methods, to look at the effectiveness of these actions and to identify any new issues or problems, as presented in steps six and seven in the cycle. The AR cyclical processes are repeated until participants reach a consensus that the problem is resolved, as illustrated in Figure 3-2.

A mixed methods approach is used within this study. The term 'mixed methods' has been used to describe the approach where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches and concepts into a single study (Golder, Light & Stirk 2007). Mixed methods are indicated for projects, surveys, evaluation and field research that use multiple sources of information (Johnson & Onwuegbuzie 2004).

Mixed methods are particularly useful as they allow multifaceted observations and adaptation of a range of research methodologies to a research setting and questions with unique characteristics (Johnson & Onwuegbuzie 2004). A mixed methods design can allow for corroboration of data leading to elaboration of the findings, with the qualitative data analysis demonstrating how the quantitative findings apply in particular cases (Brannen 2005). There is also scope for complementary data, where the qualitative and quantitative findings vary, but together they generate new insights (Brannen 2005).

Mixed methods are achieved in both exploratory and evaluative contexts, and allow a range of theoretical perspectives, all of which are reconcilable with AR's focus on involvement, empowerment and future orientation (Munn-Giddings & Winter 2013). Neither the qualitative nor the quantitative data sets are privileged, so data collected sequentially was of equal value.

Because AR focuses on voice and everyday experiences, qualitative methods are commonly employed to elicit participants' experiences, meanings, and interpretations (Meyer 2000). Additionally, if the research question at the centre of AR is best answered by quantitative methods, then a quantitative methods is of course the method of choice (Balakrishnan & Claiborne 2017). This makes mixed methods the most appropriate approach for this AR study, with the data collected being used to shape the AR process (Johnson & Onwuegbuzie 2004). For instance, in Phase One, quantitative data was collected to quantify numbers of medication errors, and, to understand why these errors were occurring, qualitative data was collected. Similarly, a mixed method was also used in Phase Three to evaluate the effectiveness of the interventions, demonstrated by the number of medication incidents (quantitative) and, to explore the perceptions of nurses about the practice change, focus group and observation of practice were used (qualitative). Qualitative data was also collected in Phase Two (interviews and meeting minutes) to explore the nurses' perceptions of participation in research. Mixed methods is useful to answer different enquiries in one study (Golder, Light & Stirk 2007). This makes mixed method the most suitable approach for providing a comprehensive picture of the medication process and medication safety culture on the ward.

3.4.1 Action research phases and data collection

As indicated above, varying quantitative and qualitative data were collected and analysed in each of the three phases of this research. This section provides the details of the data collected and analysis of each AR phase. An overview of the data and analysis for each phase is captured in Table 3-2. Detailed information about the type of data collection and analysis will be outlined later in this chapter.

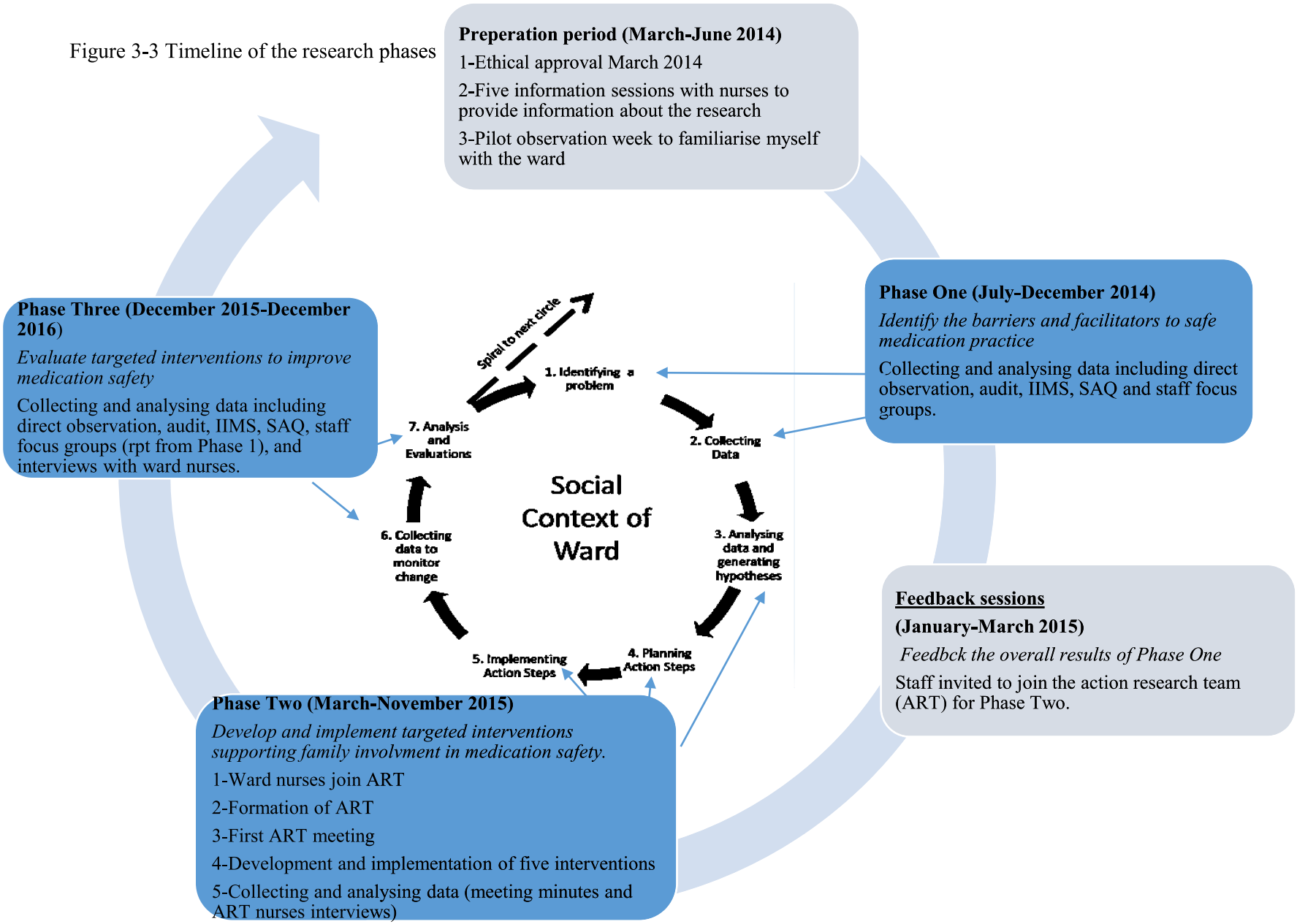
Data	Collection Method	Source	Phase	Data Analysis
Quantitative: Medication error rates and measure of severity or harm	Incident Information Management System – last 12 months and ongoing	System	All phases	Descriptive and inferential statistics Incidents and trends
Qualitative and Quantitative: Organisational/environmental factors that contribute to medication safety and risk	Workplace Culture Critical Analysis Tool (WCCAT) – A validated, reliable approach to collecting observational data (McCormack et al. 2009)	The ward staff and the environment	1 & 3	Identify common themes and patterns
	Audit developed – based on the hospital medication policy, composed of 22 steps	Nursing Staff Medication handling policy	1 & 3	Adherence and deviations in practice Errors and trends
Quantitative: Measure of staff perception of patient safety	Safety Attitudes Questionnaire (SAQ) – A six factor 36 item psychometrically validated questionnaire (Sexton, Thomas & Grillo 2003)	All staff	1 & 3	Descriptive and inferential statistics
Qualitative: Build on results of data already collected e.g. observational and audit data, incident data and results of questionnaires	Focus group (30-45 minutes)	Nursing Staff	1 & 3	Inductive thematic analysis using a six-step process. Each data set analysed separately then compared
Qualitative: The influence of research participation on Action Research Team nurses	Six semi-structured interviews and meeting minutes	ART nurses	2	Inductive thematic analysis
Qualitative: The influence of research on practice culture of the targeted site	Eight semi-structured interviews	Ward nurses not part of the research	3	Inductive thematic analysis

Table 3-2 Summary of the data and analysis in each phase

This AR was commenced in 2014 with a preparation period of three months. The aims of this period were to obtain the ethical approval (the ethics process is discussed in detail later in this chapter) from the Ethics Committee and, to prepare myself for data collection and be more familiar with the research context and other researchers in the team. After obtaining the ethical approval, I prepared the nurses to actively participate in the research activities by providing them with information about the research. As stated earlier, the research has three phases. In each phase there are different research activities of data

collection and analysis. Figure 3-3 provides a summary of the research and the different research activities of the three phases. The details of the different research activities are described in more details in the following sections.

Figure 3-3 Timeline of the research phases



Phase One: **Identify the barriers and facilitators to safe medication practice** (first two steps of the action research cycle: identifying a problem and collecting data)**.**

The aim of this phase was to identify the barriers and facilitators to safe medication practice. More specifically, the data collection from multiple sources in this phase aimed to 1) build an overall picture of medication safety from the perspective of the organisation, staff and the patient, 2) provide baseline measures of medication error, and 3) provide an overview of the structures and systems that support medication practice.

This phase involved Incident Information Management System (IIMS) data, direct observations of drug administration practice, a medication audit based on the medication policy, the Safety Attitudes Questionnaire (SAQ), and focus groups with staff.

Data collection

Incident Information Management System (IIMS) data

IIMS was established by the NSW Health Department in 2005 as a key initiative of the patient safety and quality program (NSW Department of Health 2005). IIMS is an information system that assists healthcare workers to minimise risk by producing reports for managers and relevant committees managing clinical (patient) incidents as they occur. IIMS provides online notification and management of the clinical incidents. The aim of this system is to gather information on all incidents that might affect patient safety, to enable healthcare professionals to identify and analyse the contributing factors and learn from this data to improve patient safety and care (Travaglia, Westbrook & Braithwaite 2009). The reporting of any incidents, near misses and complaints are reliant on staff self-reporting and entering errors into the NSW Health IIMS. For this research, all medication error rates were explored by using the IIMS system. All medication-related IIMS data for the targeted ward, that was entered between 2008 and 2013 were reviewed, tracked, investigated and classified by a designated hospital employed safety officer, independent from this project. Once ethics approval was obtained, this data was made available to the research team. The data included the error rate, types of errors and the times of errors. A comparison with the organisation's overall medication error rate was also available.

Observational data

The Workplace Critical Culture Analysis Tool (WCCAT) (McCormack et al. 2009) was used to record direct observations of nursing staff during medication preparation and administration as seen and heard (see Appendix 3 for the observation template used in the observation). WCCAT is a reliable approach to collecting observational data (Dewing et al. 2011) and is consistent with the philosophy and values of emancipatory practice development (McCormack et al. 2009). Participant observation is an innovative qualitative research method of inquiry and a rich source of data that is commonly employed in AR and aligns with the concepts of CSS (MacDonald 2012). The rationale for conducting practice observation was that it would provide rich data on the realities of current practice from an outsider perspective (McCall 2017). Observation is about being with other people to learn how people respond to a situation (Liamputtong 2009). Observational data was used to document what medication practice looked like on the ward during peak administration times. The aim of this approach was to gain insight into nurses' medication practice and how they prepare and administer medication.

Observation provides a picture of how nurses work within their physical environment as it occurs (Mulhall 2003), and this is one of the objectives of the observation in this research. The importance of observation is that the evidence comes from seeing what people actually do and listening to how they communicate (Mulhall 2003). The research team decided, after reviewing the literature and critical discussions, that the focus of the formal observation period would be on 1) the physical environment, 2) the verbal and non-verbal communication between the nurses during the preparation and administration of the medication, 3) any action nurses undertake during the medication process, and 4) the people (such as nurses, patients, families, doctors and pharmacists) who are involved in preparing and administering the medication and any associated activities. Three research observers participated in this data collection stage.

Pre-observation period:

The observers discussed the project aims with the nurses prior to commencing the observations, to provide them with information about the research and to outline the reasons for the observation of medication practice. Staff were provided with written information about the study prior to activities commencing (see Appendix 4). The observation processes were explained to the nurses, for example, where the observers will be positioned, number of observers, number of observations to be undertaken, frequency of observations, and the types of notes the observer will maintain. These arrangements were negotiated with nurses and the nursing unit manager (NUM) prior to the commencement of the observation period. The ethical principles underpinning the processes were also discussed with nurses, to avoid any stress, concerns and fears of the nurses during the observation. Process consent was obtained, that is, at each observation period verbal consent was sought from patients and nurses for the observations being undertaken (O'Neill 2003). Nurses were able to opt out of being observed, without any adverse consequences, and were aware that they could withdraw consent to being observed at any time. Nurses were also informed that confidentiality, anonymity and non-interference with ward activities would be maintained, unless unsafe practice was observed. Further details of ethical considerations will be discussed later in this chapter.

Preparation period:

To prepare myself for the observations, I attended the first week of ward observations with a more senior colleague from the research team. The aims of this pilot observation week were to become familiar with the environment, the vibe and dynamics of the ward, and to allow the nurses to become more familiar and comfortable with my presence on the ward, prior to the start of the formal observation period. In addition, it provided an opportunity for me to verify with a more experienced observer what I was capturing, when we compared our observation data. This period increased my confidence and confirmed to me that I was collecting data about what was being observed, rather than what I was thinking about what I was observing. The data from this first week was not included in the final data results.

Although, as stated earlier, engaging and recruiting parents in this study was not the focus of my research, coincidentally, the parent data formed part of the context of the observations. For example, the interaction and communication between nurses and parents captured (in week three) is reported in this thesis; however, the focus of the observation itself was not on either patients or parents. My focus was on nurses and, therefore, aspects of family and patient engagement in the data collection is often not reported in this thesis; this is reported by the broader research team.

Observation period:

After the "training week", I was stationed on the ward for a whole shift, for three consecutive weeks, at different times and different shifts (morning, afternoon and night). The focus of the observations was divided: in week 1, the focus was to explore the dynamics, culture and communication of nurses during the preparation of the medication inside the medication room, and in weeks 2 and 3, the nurses were observed moving from the medication room to the bedside where they were administering the medication to the patient.

The observation notes were written shortly after finishing the observation, with the date, time and place recorded when the notes were written. The notes were hand-written and if there were any comments or questions related to the observation, these were captured for discussion and exploration with my supervisors and the research team. These questions and comments were written as soon as the observation period was finished, to develop a better understanding of what was being observed (Liamputtong 2009). I chose to stand outside the medication room and patient room to avoid blocking or disturbing the nurses. The focus of the observation was not based on the number or name of individual nurses being observed, rather the observation objective was to explore the dynamic of the nurse's practice. However, while no details about the specific number of nurses were written during the observation, the number of nurses in the medication room was captured. For example, during the observation, there were instances where four or five nurses were observed in the medication room at the same time.

The observation process was continuously reviewed with my supervisors for reflection and to explore 1) what worked well during the observation, 2) what things could be improved upon, and 3) what I learned about observation skills and techniques. The research team also discussed when to stop the observation, when it was perceived that enough observation data had been collected, for example, when the observers were no longer observing any new activities. Eleven observations were conducted at morning, afternoon and night shifts during July 2014, over a three-week period. All the observation notes were collected and analysed by me, and reviewed by the other observers. More details about data analysis will be provided later in this chapter.

Medication policy audit

An audit tool was prepared utilising the WCCAT tool to facilitate collection of data against the Medication Management and Handling Policy (based on Guideline No: 1/c/06:8232-0108) to explore any deviation in practice (McCormack et al. 2009). The steps of medication practice were extracted from the organisation's medication handling policy. According to this policy, these steps must be performed by nurses for all medication practice.

The medication policy of the organisation includes all the information related to medication process and practice. The specific items that must be performed at the administration phase of the medication process were tracked across the policy, and 22 separate checking 'steps' were identified. These items were then collated together and a tool was developed and checked with members of the research team and the nursing educator, to verify the items and develop an audit tool (see Appendix 5 for details).

During each audit, observations were recorded against the 22 checking 'steps' in the 'medication process' (i.e. medication management and handling). The aim of this audit was to explore the nurses' compliance with hospital policy. This was an important approach as it measured what nurses actually do in practice as opposed to what they say

they do (i.e. compliance with the medication policy including double-checking at the bedside).

The audit has a checklist where each step recorded has three responses to choose from: achieved, not achieved or not applicable (NA). Nurses were randomly selected to be observed. I avoided following the same nurses, each audit was performed on a different nurse. The audit followed the journey of the nurses while they were performing the medication process, starting from preparing the medication, until they administered it to the patient and signed the medication chart. Process consent was also used for conducting the audit and nurses were able to refuse to be observed without any adverse consequences. The audit was finalised by me as soon as the nurses had completed the medication process. My role was then to collate and analyse the data from all the audits.

A total of 13 medication audits were undertaken in Phase One: 10 morning audits and three evening audits were performed in August 2014. The research team agreed to stop collecting the audits when I was no longer observing any new activities. As part of the audit process, it was noted how many of the 13 medication rounds fully complied with medication policy and guideline recommendations, what checking steps were being missed, and when nurses were non-compliant with the hospital policy.

Safety Attitudes Questionnaire (SAQ)

All nurses, allied health and medical staff on the ward were invited to complete a de-identified SAQ online, using Survey Monkey. The reason for including all staff working on the ward was that everyone (directly or indirectly) influences the safety, dynamics and flow of the medication practice on the ward. For example, disturbing nurses during preparation or administration of medication, or communicating with parents and patients while receiving medication. This was important to see how staff safety attitudes influenced the overall results of medication administration.

The questionnaire aimed to measure the effectiveness of safety improvement activities, relating to improving medication safety, that were implemented as part of this project. The SAQ, a psychometrically validated instrument, captures the attitudes and perspectives of staff on specific safety issues at a granular level (Abstoss et al. 2011). The validity and reliability of the SAQ has been documented in Taiwan (Lee et al. 2010), the US (Modak et al. 2007), the UK (Hutchinson et al. 2006), and Norway (Deilkås & Hofoss 2008). The SAQ has been used in both inpatient (Haynes et al. 2011) and outpatient settings (Modak et al. 2007).

Achieving favourable scores on the SAQ have been associated with fewer medication errors, lower ventilator associated pneumonia, fewer bloodstream infections, and shorter intensive care unit lengths of stay (Sexton & Thomas 2003; Sexton et al. 2006). The SAQ provides a baseline measure of safety attitudes that can then be used to inform change and as a pre- and post-intervention measure (Haynes et al. 2011). The questionnaire was developed to measure frontline staff's perspectives of safety in a patient care clinical area (Sexton et al. 2006) and the results enlighten stakeholders to everyday practice. The SAQ has been used to prompt patient safety improvement activities and to measure change in safety related attitudes after these interventions were implemented (Lee et al. 2010). The SAQ has demonstrated good psychometric properties in patient safety culture and actual safe practice. Healthcare organisations can use the survey to measure caregiver attitudes about six patient safety related domains (Modak et al. 2007).

The SAQ is a two-page questionnaire with 36 items (six domains) as well as demographic information. The six domains are: teamwork climate, safety climate, job satisfaction, stress recognition, perceptions of management, and working conditions. All 36 items use a 5-point Likert scale, with one corresponding to "strongly disagree" and five to "strongly agree". Three items are worded negatively; these are reverse scored. The definition and question examples of each domain are presented in Table 3-3 (Sexton et al. 2006). The SAQ requires around 10-15 minutes to be completed. The questionnaires were emailed to all staff who were working on the ward. Implied consent was used, where staff could refuse to participate in the survey by not returning their answers (O'Neill 2003).

Domain	Domain definition	Question examples
Teamwork climate	Perceived quality of collaboration between the team members.	• Nurse input is well received in this clinical area • I have the support I need from other personnel
Safety climate	Observing the organisational commitment to safety.	• I would feel safe being treated here as a patient • I am encouraged by my colleagues to report any patient safety concerns I may have
Job satisfaction	Positivity about the work experience.	• I like my job • This is a good place to work
Stress recognition	The influence of stressors on staff performance.	• I am less effective at work when fatigued • I am more likely to make errors in tense or hostile situations
Perceptions of management (unit and hospital) *have same questions with same aim*	Approval of managerial action.	• Hospital management supports my daily efforts • Unit management is doing a good job
Working conditions	Perceived quality of the work environment and logistical support such as staffing and equipment.	• This hospital does a good job of training new personnel • Trainees in my discipline are adequately supervised

Table 3-3 SAQ domains, definitions and question examples

Focus groups

Four staff focus groups were facilitated by a member of the research team, along with myself, in September 2014. Focus groups have been described as a planned discussion designed to obtain perceptions on a defined area of interest in a permissive, non-threatening environment (Doody, Slevin & Taggart 2013). Focus groups combine elements of both interviewing and participant observation, and provide an opportunity to probe the participants' cognitive and emotional responses, to generate rich interactive data about social phenomena through the opinions expressed by participants individually and collectively (Massey 2011). The key feature of focus groups is the active interaction among participants to explore their views and opinions (Jayasekara 2012).

A focus group is a useful method of developing an understanding of participants' perceptions, views and feelings about a particular issue, product, service or idea (Doody, Slevin & Taggart 2013). The focus group provides a means of listening to the perspective of key stakeholders, to seek their opinions, values, and beliefs in a collective context and learning from their experiences of the phenomenon (Halcomb et al. 2007; Jayasekara 2012). The focus group method recovers the voice of members of marginalised groups in society (Jayasekara 2012). This is consistent with the design of this AR, where focus groups provide the staff with an opportunity to freely express their opinions and perceptions of the data (Doody, Slevin & Taggart 2013). The focus group method is consistent with AR principles of democratising the research process, because it is considered a socially oriented process where participant viewpoints are recognised, valued, and they have an equal opportunity to communicate their beliefs and ideas (MacDonald 2012).

In this research, the results of the observational data, IIMS, SAQ and audit findings were presented to staff at the beginning of the focus group sessions, to ask the nurses about their opinions of the results and to understand from them what sense they were making of these findings. The intent of the focus groups was to then capture the nurses' perspectives on the data collected and collated by the external research team. The real strength of focus groups is not simply in exploring what participants have to say, but in providing insights into the sources of complex behaviours and motivations about a practice; in this research this refers to medication practice (Jayasekara 2012). A secondary intent was to recruit interested nurses to become part of the subsequent phases of the research study. The sessions were conducted on the ward and each session included different nurses, to ensure that the majority of nurses had the opportunity to reflect and discuss the data. This action was an important initiative that aimed to create a safe environment that would promote a free and open information exchange between participants (Jayasekara 2012).

Each group compromised 3-5 ward nurses who were on shift on the day of the sessions and were willing to participate in the sessions. Written consent was obtained from the

nurses prior to commencement of the focus groups. The only difference between the participating nurses was their level of clinical experience. The NUM did not participate in any of the sessions in order to avoid the generation of power issues and to promote the comfort of participants (Jayasekara 2012). The time of the sessions and number of nurses in each group was dependent on their availability. All sessions were conducted in the staff room located on the ward, for the convenience of the nurses and to obtain as many nurse participants as possible.

Prior to commencing each focus group cycle, a question guide was developed as a way of inviting exploration of different views, solutions, and suggestions. The guide included a select group of questions, or discussion points, that were designed to elicit conversation among participants (Massey 2011). The principal supervisor and I were the moderators. Each session began with welcoming and thanking the nurses for their time and participation, confirming the ethical considerations of the research, and reminding the nurses of the research aims. Then the data collected in Phase One was fed back to the nurses via a PowerPoint presentation. All data was presented in table and graph format to make it a more meaningful presentation for the nurses. During each focus group session, nursing staff were asked to reflect on the presented data, to relate the data to their own medication administration practice, and to explore perceived barriers and facilitators to safe medication administration practice. The nurses were encouraged to express their perceptions about the data.

The questions used in the focus group were open-ended questions. Care was taken not to ask leading questions, nor make suggestions that could influence the participants' responses (Jayasekara 2012). The sessions were concluded by providing nurses with an opportunity to verify their feelings/ideas, and closing statements to summarise what was collected in the session.

Focus groups were conducted until it was apparent that no new data was being generated. Four focus groups were conducted with 18 staff in attendance. The focus groups were

audio-recorded and then transcribed by me. Each focus group session lasted for approximately 60 minutes.

Data analysis

Thematic analysis for practice observations and focus groups

Thematic analysis of the data from the focus group sessions and observations occurred in parallel with myself and other researchers in the team. Thematic analysis is considered a qualitative analytic method that is suitable for nursing research (Braun & Clarke 2006). Thematic analysis involves the search for common themes emerging from data. These themes reflect a range of individual attitudes, opinions, and beliefs, as well as touching on otherwise unarticulated norms and social values (Vaismoradi, Turunen & Bondas 2013). Thematic analysis offers a meaningful and common method for the analysis of evaluation oriented focus groups (Massey 2011). Thematic analysis can be used with a range of theoretical frameworks and has the potential to provide a rich and complex account of the data (McCall 2017).

The following steps were used to thematically analyse the focus group and observation data. Figure 3-4 shows the thematic analysis process that I followed for the observation and focus group data (McCall 2017). The analysis was conducted independently by me and one other member of the AR team.

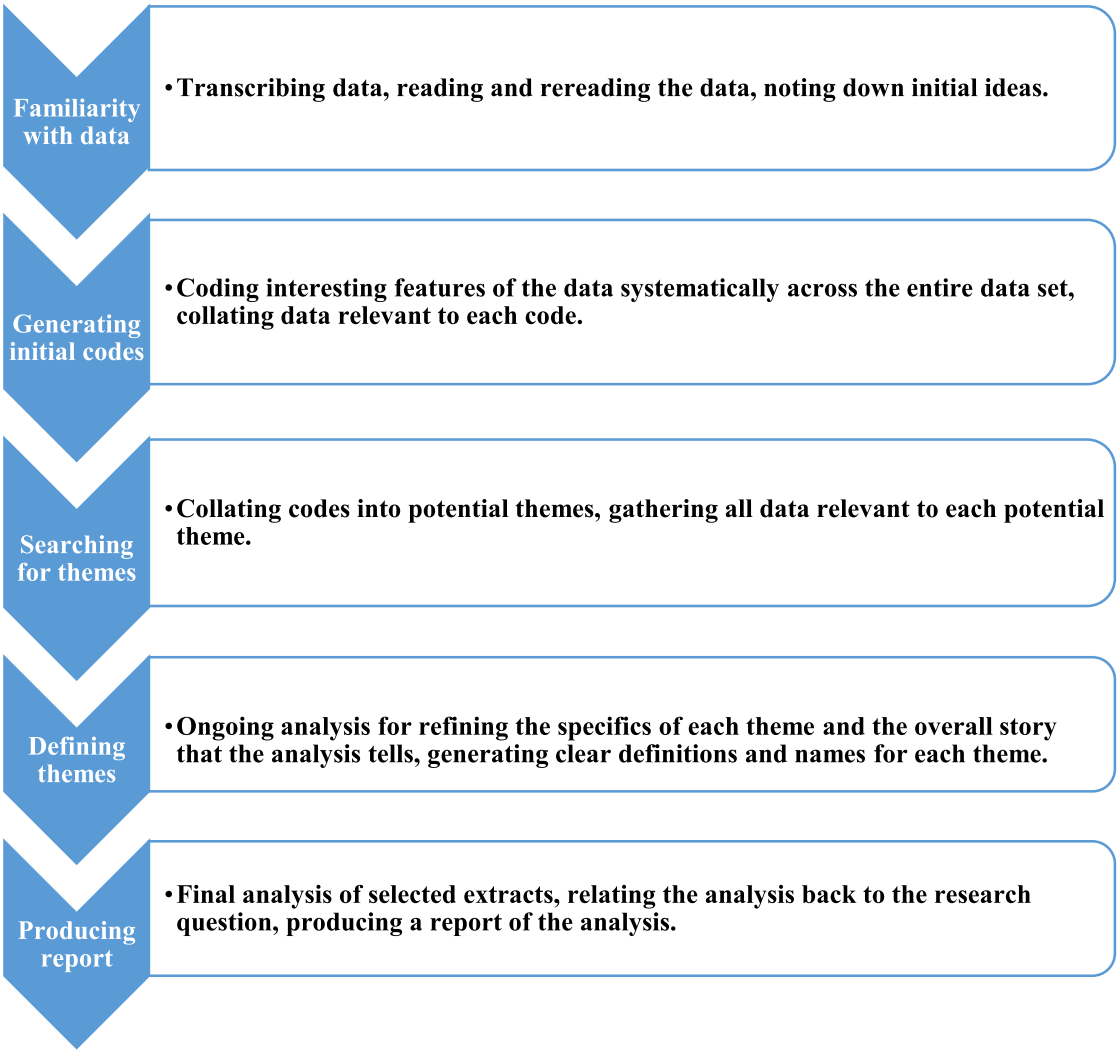


Figure 3-4 Thematic analysis process

Firstly, in order to become familiar with the data, the transcriptions of both the focus groups and observation notes were read and re-read by me, and any initial ideas or comments were written down for reflection and discussion with my supervisors. Searching for common ideas that have similar meanings were conducted. Secondly, the initial coding was generated, by searching across the data to find repeated patterns of meaning (Liamputtong 2009). These codes were revised and the links between them were identified. Thirdly, codes were collected under potential categories/themes and compared in relation to the entire data. Fourthly, a thematic map was generated to review the resulting themes and compare them with other data sets. The fifth step included ongoing analysis of the themes to refine them, so that clear definitions and names for each theme were generated. The themes identified independently by myself and another researcher

were then compared, and when mutual agreement on the themes was reached, a final report was produced. The entire process was reviewed by my supervisors.

The observation notes were collected and themed at the end of the three weeks of observations. The initial themes were created by finding the similar patterns and trends in the observation notes. The emerging themes were compared between the two researchers to clarify and confirm the initial themes to validate the findings (Liamputtong 2009). The resulting themes were then reviewed by the broader research team.

Transcripts from staff focus groups were reviewed and thematically analysed by myself, and three other researchers who performed the same process. Thematic analysis of the transcripts allowed for the data to be categorised before undergoing further revision, grouping and reduction (Jayasekara 2012). The thematic analysis of focus group transcriptions followed the same phases of the thematic analysis of the observation data (i.e. becoming familiar with the data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, producing the report). The themes were matched and agreement on the resulting themes was reached between the researchers. These themes were then verified by the broader research team.

Policy audit

Audit data was analysed using descriptive analysis. The achieved steps (Yes) was calculated to explore the compliance of each step by using the following formula: Number of Yes / number of audits X 100, resulting in the compliance figure presented as a percentage. The results were presented in a table showing the percentage achieved for each of the 22 steps.

IIMS

Simple descriptive statistics for numbers of medication error rates, types and trends were analysed and reported. The overall number of medication administration errors were calculated centrally. Also, information about types of errors, time of errors and the type of medication involved in the errors were collected. Trends and patterns were uncovered and presented to staff in the form of graphs (e.g. see page 155 in Chapter Four). My role was to convert the numerical data into meaningful graphs and make it more presentable and easier to understand for the nurses on the ward.

SAQ

Descriptive statistics were used to analyse the SAQ data. Questionnaire responses were exported from Survey Monkey. Questions were grouped and recoded into six domains and calculated into a percentage, as per SAQ instrument instructions (Sexton et al. 2006), as the following:

- Reverse score all negatively worded items
- Calculate the mean of the set of items from the scale
- Subtract 1 from the mean
- Multiply the result by 25.

This provides a percentage score for all domains relevant to the number of positive responses (agree, strongly, disagree) for each item.

To provide the nurses with a meaningful presentation of the SAQ results, a traffic light colour coded system was used. The traffic light system presents the results using traffic light colours to show the degree of urgency of the results to the audience. If the average response in any domain was less than 60%, it was placed in a red zone indicating it was an issue that required urgent attention. If the average of a domain was between 60%-80%, it was placed in the amber zone, which indicated that the domain was in the risk zone and required attention and needed work to improve safety this area. Finally, the green zone, where the average was above 80%, indicated that the results were satisfactory and staff

needed to ensure the domain stayed within this zone, by continuing to keep up the safety standards. In addition to the domains' mean scores, staff were also presented with the mean score for each item, to enable them to look at individual questions that contributed to the overall results, as this may provide some guidance as to where improvements may be required.

To summarise the data collection and analysis process in Phase One, a flow chart is presented in Figure 3-5. As stated earlier, each data set in Phase One was analysed separately. Then the results of the observations, audits, IIMS and SAQ were compared to develop a comprehensive picture of medication safety on the ward at the time the data was collected. Graphs and diagrams were developed to provide a meaningful presentation of the combined results, and these combined results were explored during the focus group sessions with the staff on the ward. The data from the focus groups were then analysed separately. The results from each data source in Phase One were collected and combined, and diagrams and tables to summarise the findings were developed.

Semi-structured interviews with parents and parent survey were also conducted and thematically analysed, and presented with the other data to nurses during the focus group sessions. This data was part of the overall study, but as this was not the focus of this thesis, the results are not reported here.

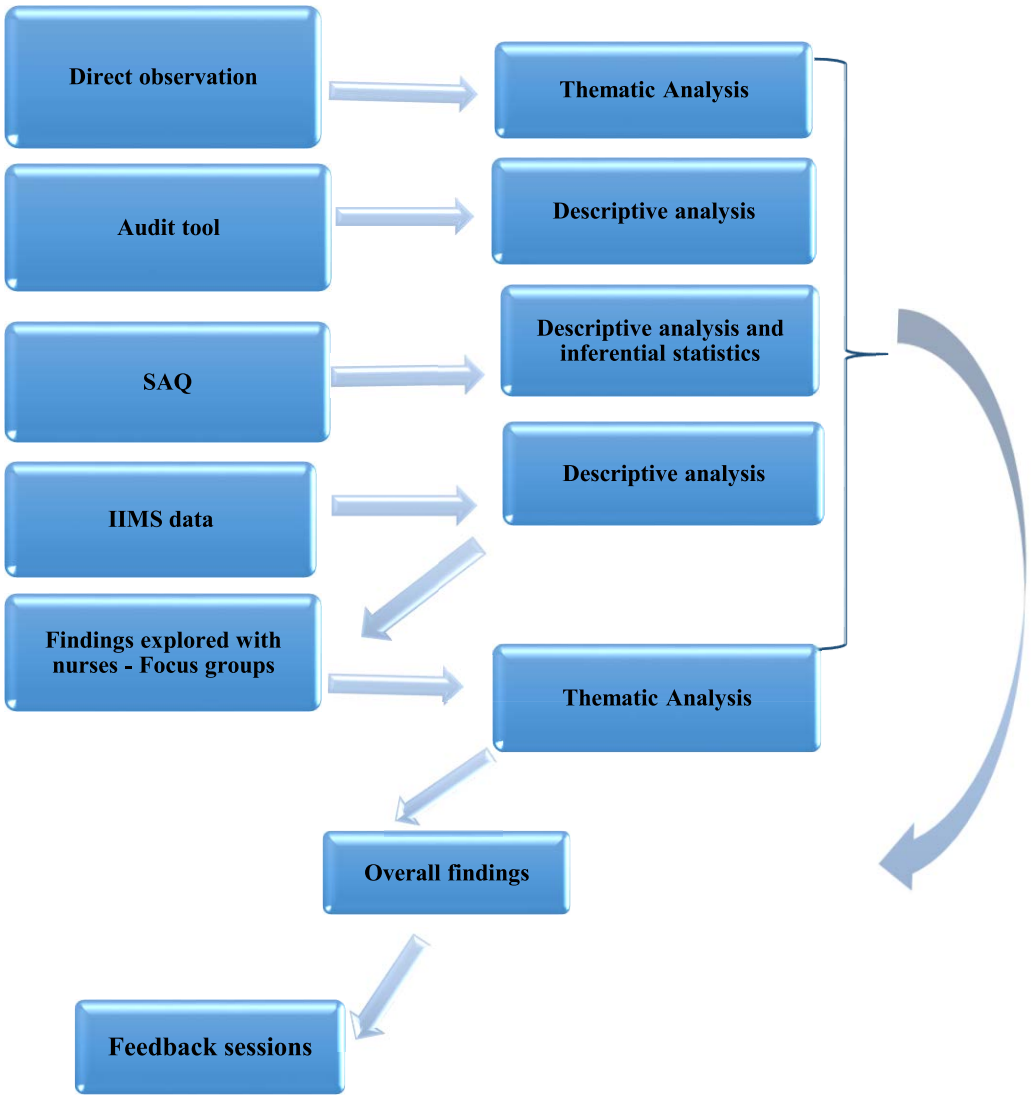


Figure 3-5 Data collection and analysis process in Phase One[1]

Overall findings obtained from Phase One were then summarised by the project team and presented back to all staff via a number of feedback sessions. This data built upon the information provided prior to the focus groups and included thematic analysis of the focus groups, as well as themes from the parent interviews. Five feedback sessions were conducted on the ward between January and March 2015. I and another researcher conducted these sessions, with the aim of the feedback sessions to enhance the understanding of the staff of the overall findings of Phase One. Table 3-4 shows the details of my role in Phase One data collection and analysis.

[1] The parents' data (survey and interviews) were included in the overall findings that were presented to nurses during the focus group sessions.

Type of data	Data collection	Data analysis
Direct observation	10 rounds of observation collected over three weeks	Thematically analyse three weeks of observation
Audit tool	Develop the tool Collect the data for 13 audits	Descriptive analysis of 13 audits
SAQ	Follow up with data collection / encourage nurses to participate	Assist in analysis Develop graphs
IIMS data	Follow up on data collection	Manage the data by developing meaningful graphs
Focus group	Facilitate four focus groups	Leading role in the thematic analysis of the data

Table 3-4 The PhD candidate role in Phase One data collection and analysis.

Phase Two: Develop and implement targeted interventions in the medication safety agenda using steps 3, 4 and 5 of the action research cycle (Generating hypothesis, developing and implementing action steps)

The objectives of this phase included A) forming the ART by inviting clinical bedside nurses to join the research team, B) developing and conducting regular ART meetings to review Phase One data to date, C) developing and implementing targeted interventions to improve medication safety on the ward, and D) exploring the perception of the ART nurses after engagement in this research.

Formation of Action Research Team (Jan-Mar 2015)

In Phase One, the ART consisted of an academic, a clinical pharmacist, an academic nurse researcher (who was the team leader and also one of my supervisors), a research assistant, the Executive Director of Nursing of the organisation, and myself. During Phase One, the team aimed to explore the nature of medication practice of this ward. At the end of Phase One, written recruitment flyers were placed on the ward and in the staff room to invite nurses to join the ART, and verbal invitations were made to the nurses during focus groups and feedback sessions. During these sessions, the purpose of the research was explained to the nurses and any questions raised by the nurses were answered. The potential benefits for nurses participating in the research were outlined, including gaining insight into their own medication practice, the ability to directly influence nursing practice on the ward, and gaining new knowledge and skills, which could then be used in their professional development portfolio. The nurse manager and two clinical educators were involved in supporting the research team, to assist in planning and facilitating the engagement of the ward nurses who expressed interest in the research. It was made clear to the nurses that joining the ART was voluntary (as outlined in section 3.9) and that they would be given time away from direct patient care to undertake the research activities. All nurses on the ward were invited to join the ART.

At the start of Phase Two, the recruitment of nurses from the clinical team (ward nurses) occurred. It was believed that the nurses' engagement in the ART would facilitate and

sustain any potential improvements in medication practice, due to their position and role in the medication process before, during and after the research. Even though many nurses verbally expressed interest in joining the ART during the focus groups and feedback sessions, most nurses did not follow up on this. Six registered nurses (RN) volunteered to be part of the ART and they were added to the ethics approval, as per the organisation policy.

The ART nurses had different levels of clinical nursing experience (2-15 years), with one of the nurses a Clinical Nurse Educator (CNE) and the other five bedside clinical nurses. Three had more than eight years' experience, while one had four years and the other two had two years' experience. None of the nurses reported having any prior research experience. The final formation consisted of the original team, as outlined on page 103, as well as the five RNs and one CNE permanently employed on the ward. The ART met every six to eight weeks, depending on the ward-based workload, activity and rotating staff rosters.

The endorsement of the NUM was critical in ensuring that staff knew they would be supported throughout the research process. For instance, there was an agreement with the NUM and the ART to enable the ART nurses to attend the meetings, which were usually a full day out of practice. Funding was obtained through the Nursing & Midwifery Office of NSW Health, to cover the cost of staff (backfill) spending dedicated time working on the project. This included attending AR meetings with the team, undertaking research activities, and attending seven full day workshops spread over an 18-month period. This meant that rosters had to be adjusted to accommodate the release of all six nurses on a given day. The nurses' participation in the project also counted toward accumulating Continuing Professional Development hours for professional registration requirements.

The nurses were also provided with support and assistance regarding the actual research process. They were provided with research skills training, such as 1) how to review literature, 2) developing and asking critical questions, 3) data collection and analysis, and

4) ethical conduct of the research, for example confidentiality, safe storage of data and so forth. During the research process, I was in regular contact with the nurses via emails and through regular ward visits, to assist them in their undertaking of research activities.

Action Research Team (ART) meetings

The ART meetings took place every six to eight weeks with the first meeting held in April 2015. The preparatory ground rules, or Ways of Working (WoW), were developed as a starting point. The team agreed on the WoW, which included being clear about the aims of the research and actions, being respectful, engaged in teamwork, support of each other, equality in participation, privacy and confidentiality. The aim of this step was to create a cohesive, safe and comfortable environment to discuss any sensitive issues, such as what happens when medication errors occur. The WoW are the foundation of the research team meetings and set an agreed standard of behaviour that guide how the group will interact and behave toward one another (Wilkinson 2012).

The meeting agenda was sent to all members a few days prior to each meeting, to outline the plan and objectives of the meeting. A typical ART meeting commenced at 8:30am and included morning, lunch and afternoon tea breaks. These times were important for the team members to get to know each other. Different members of the team would provide the morning tea for the meeting. Each meeting started with an "ice-breaker" activity to develop a stronger rapport between the team members.

The first ART meeting aimed to provide the nurses with an opportunity to become familiar with the rest of the team members and to familiarise them with different data sets in more depth. The following meetings usually started with the team members reviewing any updates from the ART nurses on the progress of their work, issues, data collection and results. The objective of this step was to obtain an update from nurses on the progress of their work. After the review, each senior research team member of the ART joined one or two of the ART nurses, forming small subgroups for analysing and reflecting on the

data that had been collected before the meeting. This was done to support the learning and development of the ART nurses in relation to the research process. Following this, all subgroups would come together to discuss their comments and participate in the discussion about the data. At the end of the meeting, the ART nurses (with the other researchers) were asked to reflect and evaluate on their learning experience from the meeting. The following self-evaluation questions were posed, 1) how do you feel about today's meeting? and 2) what have you learned today? The responses to these questions were reported in the meeting minutes and formed part of the Phase Two data. The data generated was used to explore the nurses' perceptions of participation in the research. Besides utilising this data for exploring the nurses experience in this project, the data was also used to improve the vitality of the meetings, to increase the team members' comfort. For example, at the first meeting there was feedback about the meeting's venue, a room that had no windows and ART members did not feel comfortable in the room. Consequently, the following meetings were conducted in more spacious rooms with windows. The ART members felt more comfortable about the venue in their comments in the following meetings.

A summary of the meeting (minutes) was produced at the end of each meeting and sent to all team members within one week of the meeting. These meeting minutes formed an action plan for the nurses, to be used between meetings. Typical ART meetings finished at 4pm. All the meetings notes were hand-written.

The nurses were supported between the meetings. They were contacted to see if they needed help with their data collection and analysis, how to reflect on the data and/or how to develop the interventions. They were also encouraged to share any issues surrounding their work, time management or any problems that may prevent them carrying out their action plan. Such issues were discussed with the other research team members, so they could give more assistance where needed.

Dealing with data to develop and implement targeted interventions to improve medication safety on the ward

In Phase Two, the ART discussed the results of the focus groups, observations, IIMS, SAQ and audit, to support them in making sense of current medication practice, identifying areas of strength, and highlighting areas where targeted interventions could be implemented to improve practice. All results from Phase One were collated and then compared by each member of the ART. After reading and re-reading the data, the team members discussed, unpacked and analysed the combined data from Phase One. Memo pads and flip charts were used to generate codes and themes from the results. During the meeting, each subgroup of the ART (two ART nurses and one researcher) reviewed the results of Phase One and noted on a piece of memo paper what they perceived as any common themes. As the process unfolded, the text was grouped according to similar meaning. The team agreed to categorise the data into themes. These themes represented the medication practice issues on the ward. Brainstorming sessions were also conducted to discuss the issues of medication practice on the ward that influenced nurse's practice culture. All ART members were asked to reflect on the results and to explore their perception and opinions about the themes.

The ART nurses were then asked to further explore these themes with other nurses on the ward, to obtain a deeper understanding of these issues from a wider nursing perspective. Each theme was explored by one to two nurses in consultation with the broader research team. The nurses were given full freedom in choosing the themes and methods for exploring them. More details about the nurses' perception after dealing with the data will be introduced in Chapter Four.

The ART nurses then analysed the data they collected and, in response to the results, one or two nurses developed and implemented one of five identified interventions. A detailed action plan was developed by the ART to support the next phase. The researchers continued to support the ART nurses between the ART meetings. The interventions were created, evaluated and implemented by the ART nurses in the research team. They followed an AR cycle for each of the interventions, by planning the change, implementing

the change (working with staff), gathering data (evidence – pre-measures) and then evaluating the outcome (post measures). The ART nurses implemented their interventions and were responsible for observing and facilitating the implementation process for each intervention. The process of developing the implemented interventions, how they were developed, and the outcomes achieved from the implementation are described in Chapter Four.

Proposed interventions were discussed with a broader stakeholder group composed of the Parent Advisory Committee, hospital executives and the lead pharmacist, for their input and critical opinion. An implementation (and change) strategy was developed by the ART, and reviewed and endorsed by staff on the unit, prior to a stepped roll-out of the plan.

Exploring the perceptions of ART nurses after engagement in this research

In addition to forming the ART, conducting the ART meetings, and developing and implementing targeted interventions to improve medication safety, the perceptions of the ART nurses about engaging in research was explored in this phase. The ART nurses had no previous research experience, so their ability to lead part of this research was investigated. The aims of this step were to explore 1) how the nurses used the data to develop their interventions, and 2) how they were influenced by the research experience.

My role was to continuously support the ART nurses through the process, in terms of collecting and analysing the data and undertaking the implementation of the identified interventions. The details of the ART nurses' data collection and analysis activities will be provided in Chapter Four.

Data collection

The data used to explore the nurses' perceptions of research was collected from 1) the research meeting minutes, including the self-evaluation questions, and 2) semi-structured interviews with the ART nurses.

As stated earlier, the meeting minutes were hand-written and the responses of the ART nurses to the self-evaluation questions were written and collected at every meeting. The goal of the self-evaluation questions was to evaluate how ART nurses perceived, benefited or learned from participating in the ART meetings.

As AR aims to combine research, education and action in one endeavour, participation in this project would enable the nurses to create knowledge and action to transform their own practice (Liamputtong 2009). To further explore the ART nurses' learning experience and its influence on their practice after participating in a research project, semi-structured, open-ended interviews were conducted with each of the ART nurses at the end of Phase Two. Interviewing is a flexible technique that allows the researcher to explore the meaning in greater depth than can be obtained with other methods (Burns & Grove 2010).

The interview guide was developed and verified with the supervisor to cover all the issues around the ART nurses' participation in the project (see Appendix 6 for details). The questions asked in these interviews sought to explore the nurses' motivations for joining this research, their previous and current perceptions of research, and what changes they experienced personally and professionally after joining this project.

The interview location was chosen in agreement with the nurse being interviewed, a quiet environment where the privacy of the interviewer and the interviewee was taken into

account. The interviews were undertaken individually, face-to-face, and were audio-recorded. Each interview lasted approximately 30 minutes.

Data analysis

The meeting minutes and ART nurses' responses to the self-evaluation questions were collated together and thematically analysed. At the close of all meetings, any other written meeting notes/minutes were also collected. Key concepts, words and statements were analysed using the thematic analysis process mentioned earlier in Figure 3.4.

I transcribed the interviews and in this process I became immersed in the data; this enabled me to obtain many details about the interviews and participants that would improve my analysis of the interviews (Doody & Noonan 2013). The transcription was verbatim and kept all the informal conversation style and emotional expressions, such as pauses and emphases, to make a better sense of the interview and help with the analysis (Liamputtong 2009).

The transcripts of the semi-structured interviews with the ART nurses were thematically analysed to identify patterns of meaning, dominant themes and sub-themes emerging from the data, using manual inductive coding. The same thematic analysis process used in Phase One for the focus groups (see Figure 3.4, page 97) was repeated in Phase Two.

My role in Phase Two included supporting the ART nurses in the research project, in terms of data collection and data analysis. It was also to integrate them in the ART by keeping open communication channels, enabling them to ask questions and to express any concerns about the research. Additionally, I was responsible for the meeting minutes and ART nurses' interviews, data collection and analysis.

Phase Three: Evaluation of targeted interventions using steps 6 and7 of the action research cycle (collecting data to monitor change and evaluation of the change)

The same data that was collected in Phase One was repeated in this phase, to measure overall the effectiveness of the intervention bundles implemented on the ward. Each intervention led by the ART nurses had specific measures to monitor the change, with pre- and post-intervention data collection. More details about these interventions are provided in Chapter Four. Evaluation of targeted interventions commenced seven months' post-intervention.

In addition, the influence of research on the practice culture of the ward was explored with ward nurses who were not part of the ART.

Data collection

Differences between pre-intervention (Phase One) and post-intervention (Phase Three) data were measured. Key points measured were:

1. Medication administration error rates - defined as any change in the incidence rate of medication administration errors per 1,000 prescribed medications post-intervention (IIMS), and

2. Medication administration practice and safety awareness - defined as any change in nursing staff's adherence to medication policy (policy audit), improved safety culture (SAQ, focus group) and medication practice (practice observation, focus group).

The methods, processes and sequences for data collection were identical to those in Phase One of the project (see Table 3-2 for detailed information, page 83). Staff focus groups data (n = 5), observational data (n = 16 rounds), IIMS and SAQ data (n = 46) and audit data (n = 13) were collected and collated.

Additionally, eight semi-structured interviews were conducted with nurses on the ward (who were not part of the research team), to explore their perception of practice changes and if they have observed any improvement in their own medication practice since the project commenced. The aim of this step was to explore the influence of research on medication practice from the perspective of clinical bedside nurses. The interviews used open-ended questions and were audio-recorded. These interviews also provided evidence about the value of including nurses in research.

Data analysis

Qualitative

Methods used to analyse the data in Phase One were repeated to analyse the data in Phase Three. The data from the observations, focus groups and the ward nurses' semi-structured interviews were thematically analysed to highlight the influence of interventions (see data analysis processes for Phase One Figure 3-5, page 101).

Quantitative

Analysis of Phase Three data was undertaken as per the Phase One data. The policy audit was analysed using simple descriptive analysis. The SAQ was analysed using the same method as per the instrument's instructions, with questions grouped and recoded into six domains and calculated into a percentage (see data analysis for Phase One, page 96). Phase Three results were then compared to Phase One results.

The IIMS data in Phase Three was analysed by another researcher from the broader research team. The IIMS data entered in 2016 was reviewed, tracked, investigated, classified and compared with the data from Phase One in 2014. A mean score of the number of medication administration errors was calculated. Also, information about types of errors, time of errors and the type of medication involved in the errors was collected. My role in Phase Three of the data collection and analysis is captured in Table 3-5.

Type of data	Data collection	Data analysis
Practice observation	11 (out of 16) observation rounds were conducted	16 rounds were analysed
Policy audit	Eight (out of 10) audits were collected	10 audits were analysed
Focus group	Five focus groups were jointly facilitated	All were thematically analysed
SAQ	Collected the SAQ	Assisted in analysing the data Diagrams and tables were developed
IIMS	Assisted in collating data with the pharmacist	Diagrams were developed
Semi-structured interview with ward nurses	Eight interviews were conducted	Eight interviews were thematically analysed

Table 3-5 The PhD candidate's role in Phase Three data collection and analysis

3.5 The context: study setting

The study was conducted in a paediatric teaching hospital in NSW. The hospital provides quality care and clinical services to 80,000 sick and injured children each year. Children admitted to the hospital come from across NSW, Australia, and across the Pacific Rim. Most children admitted to hospital are from Sydney metropolitan and rural areas.

The study was carried out in one specialised paediatric medical ward which has a 17-bed capacity. This ward was selected for this study because it manages care of children requiring long-term treatment, due to the illness they suffer from, who are on complex medication regimes. The case mix is varied and care is provided for children with the following conditions: liver and gastroenterological disease, renal disease, haematological conditions, and endocrine and metabolic disorders. The ward admits patients 16 years of age and below.

There are 33 RNs on the ward, two ENs and one assistant in nursing (AIN). There are seven nurses on a day and evening shift and four on a night shift. The nurses work in teams of two. Each team has a load of 4-6 patients per shift. The nurses work two types of shifts, eight and twelve hours shifts.

3.6 Sampling and eligibility criteria

All staff on the ward were invited to participate in several aspects of the study. However, the focus was generally on the clinical bedside nurses working on the ward, due to their role in the medication process. Convenience sampling allowed the researcher to access individuals who were available and willing to participate in the research (Liamputtong 2009). Convenience sampling is used when the researcher needs to find participants who can provide in-depth information concerning the research question (Etikan, Musa & Alkassim 2016).

The first stage of participation was practice observation and/or the medication process audit. A convenience sample method was used to select the nurses who were on duty at that time of observation/audit. I looked at which nurse(s) were available on the shift and invited them to be observed for the audit. The nurses were given the choice to be observed and were informed that they could refuse the observation at any time with no consequences (see ethical issue management section and types of participant's consent later in this chapter for more details).

All nurses, medical doctors, pharmacists, allied health, administration staff and cleaners who were working on the ward were invited to participate in the SAQ (Phases One and Three). The SAQ considers that all members of the team have an influence on overall safety culture (Sexton, Thomas & Grillo 2003).

For the focus groups, convenience sampling was used to invite the nurses who were on duty to participate in these groups. The same convenience sampling technique was used as for the observation and audit stage of the research, described previously. Factors such as the time of the shift, workload and staffing level were discussed with the NUM and considered by the research team, before conducting any focus group sessions, to ensure improved sampling. An invitation was sent via emails to all nurses on the ward to

participate in the ART. All nurses who volunteered to participate in the ART were selected.

The nurses were invited to participate in the semi-structured interviews (Phase Three). The convenience sample method was used to select the nurses who were on duty at the time of the interviews. I had to take into account interviewing the nurses who had been working on the ward for the 18-month duration of the research. This is because some nurses started working on the ward after the commencement of the research and could not recall the medication practice changes and respond to both pre- and post-intervention measures. While some junior nurses were interviewed, the focus was on nurses who had been on the ward long enough to provide the research with their perceptions and experience of practice change at pre- and post-intervention.

3.7 Researcher position

It is clear from the literature that the position of the researcher can affect the quality of the data being collected (McGarvey, Chambers & Boore 1999). While in traditional forms of research, the researcher maintains a distance from the research subjects in order to avoid bias, in AR the researcher actively engages with the participants and is involved in problem solving (Greenwood & Levin 2006). AR requires that the researcher establishes an ongoing and purposeful relationship based on democratic principles with the participants (Coghlan & Casey 2001). This relationship presents several challenges, depending on whether the researcher is an internal or external researcher to the organisation (Williamson & Prosser 2002). The closeness of the relationship between the researcher and the participants depends on the position of being an insider or outsider researcher (Titchen 2015).

An insider researcher is an insider in the context where the action research is taking place (Hanson 2013). The insider researcher role is a combination of a clinical leader, with authority for initiating and managing change, and the role of action researcher (Morgan 2006). There are some disadvantages to being an insider researcher, for example, the

insider often finds it difficult to have enough time for the research processes, due to their responsibilities in the setting (Titchen 2015), which may affect the progress of the research process. When an insider researcher is collecting data, they may assume too much and therefore not probe as much as if they were outside of the situation (Coghlan & Casey 2001). They may think that they know the answer and not expose their current thinking to reframing, which presents biased results to the research (Hanson 2013). Insider researchers may also find it difficult to obtain relevant data, because they have to cross departmental or hierarchical boundaries, or because as an insider they may be denied deeper access, which might not be denied to an outsider (Coghlan & Casey 2001). Finally, the insider researcher can present potential problems in terms of 'objectivity' in the study, as there are likely personal costs for researchers who are trying to achieve change while running a ward or studying for a higher degree.

On the other side, an outside action researcher comes from elsewhere (often a university) (Coghlan & Casey 2001). The outsider is often in the role of action research/professional development facilitator. However, if outsiders try to bring about the change themselves, there is a real danger that the innovation or change will not be owned by those within the setting, and practice is likely to revert to old ways when the outsider leaves the setting (Titchen 2015). In outsider researcher studies, authority is vested in the researcher and the study is not truly collaborative or democratic (Williamson & Prosser 2002). There are positive aspects associated with outsider researchers, such as they can bring a fresh view to the situation and will have a greater ability to raise sensitive issues and encourage honest feedback, through assurances of anonymity (McCall 2017).

An insider-outsider researcher can be one person or a team that work(s) in the organisation, but not in the particular research setting within the organisation (Williamson & Prosser 2002). They often share the same basic values on healthcare and work collaboratively as an 'actor' (facilitator/change agent) and 'researcher'. This 'double-act' between insider and outsider combines the best and avoids the worst of the potential 'insider/outsider' tensions (Williamson & Prosser 2002). In this role, the researcher(s)

can emphatically be present in the field (as insider) and sometimes detached themselves, by avoiding engaging in any social activity with the participants (De Bie & Roose 2009).

At the beginning of this research, I was an outsider to the organisation, the ward, and the nurses. The main challenge I experienced in this research was that I did not have any prior knowledge or information about the ward culture, the staff level, skill mix, and their medication practice. I had some concerns about how the staff would accept my presence on the ward, especially when I started observing their practice. An outsider researcher may require additional time to develop links with participants and to learn how practice operates in the research setting (De Bie & Roose 2009).

However, due to my current experience as an RN in a clinical setting, I had the advantage of being familiar with day-to-day activities, language and staff roles. I decided from the beginning to have a very structured inventory for observing medication practice only, and did not become involved in activities that did not relate to medication practice; this was defined as a complete observer (Johnson 1992). I decided, as a non-participant observer, to avoid social communication with participants, in such a way, as the researcher, to keep interaction to a minimum while retaining social etiquette (Turnock & Gibson 2001).

I employed many strategies to overcome the challenges of an outsider researcher. I visited the ward to introduce myself to the NUM, nursing educator and the ward staff. As outlined earlier, my supervisor and I conducted five information sessions on the ward, before the research started, to inform the nurses about the research project and to answer any questions they had. I also started a pilot observation for a few days, prior to the observation period, to familiarise myself with the tool and to enable nurses to become familiar with my presence on the ward.

These introductory days were very beneficial to me, as a novice observer, and to the nurses on the ward, by reducing the Hawthorne effect. The Hawthorne effect is a

phenomenon of altered behaviour or performance resulting from awareness of being a part of an observational study (McCambridge, Witton & Elbourne 2014). The Hawthorne effect can occur in one's behaviour when answering questions, being directly observed, or otherwise made aware of being studied. When approached, I interacted with nurses and kept telling them about my role as an observer and to clarify that *'I am only observing your practice and not watching you'*. To avoid incidents, it is necessary for the observer to be clear about their role (Williamson & Prosser 2002). Unlike the first week, when nurses were frequently asking me if I was "watching them", as the time passed by it appeared that nurses accepted me on the ward and went back to their practice routine, forgetting my presence, and no longer asking me about the research and what I was doing there. This strategy appeared to have reduced the Hawthorne effect. For example, the second published paper from my research (Alomari et al. 2017, presented in Chapter Four), highlighted that the observations did not appear to influence the nurses in complying with practice guidelines. I learned from the pilot observation days, in particular, that the challenge for the observer is to maintain the researcher role, while at the same time 'fitting in' to the setting, so that the activity under observation is as close to real life as possible. Thus, the researcher's behaviour is important (Turnock & Gibson 2001). When the observation commenced, I decided to take the following steps:

- I limited my writing, when on the ward, to key words and short phrases, sufficient to prompt my memory when I elaborated on the notes shortly after, because constant note-writing might have caused anxiety both to staff and patients/families,
- I maintained a quiet, unobtrusive position during the observation, trying to blend into the environment, due to the physical structure of the ward,
- I interacted with staff when appropriate, yet simultaneously maintained a certain degree of distance, for example, politely declining invitations to social events,
- I recorded personal notes daily, so that checks on the possible biases associated with my role could be made. These notes were then verified by another research team member, and

- During the audit when I followed the nurses to the bedside, I maintained the privacy of the patient, by staying outside the room, but had an unobstructed view of the medication activity and could see and hear what was happening.

During the observation period, there was a small incident where I observed an unsafe nursing practice. An RN had left a medication on the patient's bedside table and left the room, while both the patient and carer were asleep. On this occasion I felt it necessary to step outside the observer role and I indicated to the nurse that this was a safety breach. In such a case the literature advocates that patient safety precedes research objectives (Williamson & Prosser 2002). More details about the change in my role, from outsider researcher to becoming an insider, will be further explored in my own reflections as a researcher in Chapter Six.

3.8 ART membership position

A researcher's position in an AR study is particularly important, because the researcher should actively engage with the participants and involve them in problem solving (Greenwood 1994). I had multiple roles in the project, from preparing the proposal, data collection and analysis, to writing manuscripts and conference abstracts. However, my essential role was facilitator and enabler, to provide nurses on the ward with a supportive and empowering environment in which they could collaboratively work to address their identified needs, assist them to engage in the ART, and enable them during the changing process of their role from clinical bedside nurses to researchers. Lewin (1946) argues that practitioners should be involved in the change process where the social problems are occurring. In AR, the role of the participants is as important as the role of the researcher, starting with identifying the problem, planning and participating in the action, and evaluating the effect of the change, as discussed earlier in this chapter. These tasks and roles gave me a central position in the ART as facilitator and enabler.

Because of the facilitator/enabler role, I was mindful of the type of relationship I had with nurses in the ART. Adler (1987) classifies membership roles in research according to the social interaction between the researchers and participants. Adler categorised the position of the research team members into three types, peripheral membership role, active membership role, and complete membership role. The peripheral membership researcher interacts closely, significantly, and frequently enough to acquire recognition by participants as an insider. However, peripheral members may hold back or be restricted from more central roles, because of the limited interaction with the participants which results in weak relationships with the participants (Adler 1987). This type of membership was not suitable for my role, because my goal as an action researcher was to have a central role in interaction with the ART nurses, to teach them research skills and enable them to collect and analyse the data they needed to develop their interventions. Due to my multiple roles as researcher (data collection and analysis) and, at the same time, facilitator, to engage nurses in the research team, I needed to have a central role that would guarantee full interaction with the nurses and other research team members.

Active membership researchers take part in the core research activities and avoid having any social role with the participants (Adler 1987). Due to their exclusive participation in the research activities, active membership researchers do not have to rely on the bond of friendship they establish with participants. These types of members are detached from the outside social world of group members of the research team, but they are still engaged in the daily inside experiences and pressures of the research setting. This membership role is important, because it provides the researcher with an understanding of the nurses daily clinical life but, at the same time, this type of membership reduces bias of the researcher, by avoiding engaging in social or personal relationships with the participants (Bonner & Tolhurst 2002).

Finally, complete member researchers are already existing members of the research group, or researchers who are fully affiliated with the group during the course of the research (Adler 1987). Adler (1987) describes complete member researchers as researchers who have to accept a new role - becoming immersed in their membership role

or becoming immersed in their researcher role (if they already belong to the group with whom they want to research). In this type of membership, researchers might struggle with role conflict if they find themselves caught between "loyalty tugs" and "behavioural claims" (Bonner & Tolhurst 2002). I was not a member of the clinical team on the ward, I came from another organisation as a researcher, and my role was to support the ART during the course of this research.

According to this classification of membership, I found myself having an active membership role in the ART. While I had a central role in the research, working with and supporting the ward nurses to engage in the research team, I also maintained a professional relationship with nurses and did not engage in their outside social world. I was engaged with the nurses around their daily work activities, listening to their ideas and thoughts about the research or their work. I also considered the work pressures they had before I met with them. For example, a few meetings were cancelled or re-scheduled at short notice, because the team members had a busy shift. I responded to that by scheduling another meeting time. This was important because it built a meaningful and trustworthy relationship with the ART nurses, by showing that I care about their daily work-related issues and could be flexible in terms of meeting with them. Despite the healthy relationship with nurses, I kept a professional distance from social interaction with them. Participation in this AR and the interaction with nurses and other research team members posed many ethical requirements and tasks. The following section will discuss these ethical issues and how they were resolved.

3.9 Ethical issues management

Ethical issues in AR are more important than other research designs, due to the close interaction and relationship between the researcher and the participants, as well as the unpredictable nature of the AR methods (Liamputtong 2009). Ethics in research aims to prevent research participants from being harmed by the researcher and the research process (Burns & Grove 2010). According to the Human Research Ethics Committee Policy for Undergraduate and Postgraduate Students, a Doctoral research project requires formal ethics approval (National Health and Medical Research Council 2007). This

project was approved by the Human Research Ethics Committee at SCHN-CHW (LNR/14/SCHN/32) in March 2014 and ratified by the HREC at the University of Technology, Sydney (see Appendix 7).

3.9.1 Risk and harm

The researcher has the responsibility to ensure the physical and emotional wellbeing of the research participants is maintained (Dickson-Swift et al. 2008). This research does not pose risk or harm to the participants. However, in research involving sensitive issues relating to health, distress may occur (Liamputtong 2009). This AR study is about changing medication practice and reducing medication administration errors. This requires the participants to report previous errors they, or their colleagues, have made in the past, or some organisational contributing factors to medication errors. These events might create discomfort for some participants. Therefore, I continually assured participants that their information, identity, data and results are all de-identified.

Discomfort may also be experienced by staff during observation of medication administration. My position as an outsider researcher may give the participants the feeling of being 'monitored' in their practice. This discomfort was minimised when I introduced myself and met the nurses during the information sessions prior to commencing the study. Also, I conducted regular discussions with my supervisors during all stages of the AR project, using a reflective process in my journal and at face-to-face meetings. This approach ensured that I was reflective on my practice and communicated my concerns (if any) during these meetings.

This AR project requires commitment from the participants over a lengthy period of time (i.e. three years). This time commitment may present a time burden on the nurses, when they have other commitments that may prevent them from meeting the requirements of this project. This can be overcome by promoting voluntary participation in the study, highlighting the importance of the topic, by providing sufficient information to the nurses,

and arranging meeting times that were convenient and suitable for them. For example, a member of the research team went on maternity leave during the project and was able to re-join the group on her return to work. Finally, as part of the ethical management of the research, the workload and the busy-ness of the nurses was taken into account, such as ensuring the participants had sufficient time allocated for attending the ART meetings, and time out to collect and analyse their data. This time out was agreed with the NUM to ensure the work flow was not affected. This approach assisted in minimising the workload of the nurses and gave them the time they required to perform their research tasks.

3.9.2 Confidentiality and anonymity

Confidentiality aims to conceal the true identity of the participants (Liamputtong 2009). When participants reveal their private world to the researcher, the researcher must make sure that this private world is protected as much as possible (Miller et al. 2012). Any breach in the participants' protected identity may lead to mistrust in the relationship between the researcher and participants, which may disrupt any future research (Burns & Grove 2010).The ART researchers ensured the names of the participants were not recorded and any identifying details were removed. Pseudonyms were used, where necessary, for reporting or disseminating the participants' data. Pseudonyms were assigned to each of the staff who participated in the focus groups and interviews, in order to ensure the confidentiality of the data and participants (Orb, Eisenhauer & Wynaden 2001).

Data from the focus groups or interview sessions could only be accessed by the research team (including the ART nurses). The transcripts of the focus groups and interviews were de-identified, prior to the ART reviewing them. This was to ensure the identity of the individual was not revealed. The questionnaires and audit tools did not contain identifiable data of the participants. In disseminating the research results in journal publications, the site where the research was conducted will be concealed, by avoiding mentioning the name of the organisation.

3.9.3 Consent and information sheet

Informed consent is defined as the provision of information to participants about the purpose of the research, its procedures, potential risks, benefits and alternatives, so that the individual understands this information and can make a voluntary decision whether to enrol or continue to participate (Miller et al. 2012). All participants voluntarily took part in the research, after providing consent before the collection of data commenced. It was made clear to the participants that they had the right to refuse to participate in any aspect of this study. Participants were also informed that they could withdraw at any stage of the study without any consequences. No participants withdrew from the study. The nurses were provided with a specific consent form according to their choice of involvement in the research (see Table 3-6). The nurses were given the option to take part in the study by completing the SAQ survey, being observed in practice, being interviewed as part of a focus group and/or joining the ART.

For the observation and audit, process consent was obtained (O'Neill 2003). Process consent is considered essential in qualitative research, and is defined as an ongoing consensual process that involves participants and researchers in mutual decision-making and ensures that the participants are kept informed at all stages of the research process (Dewing 2008). Ward nurses were informed that they could refuse by verbally declining to be observed or audited. No nurses declined or refused to be observed or involved in the audit.

For the SAQ, consent for participation was implied in completing the survey (O'Neill 2003). Written consent was obtained for the focus groups, staff interviews and for joining the ART (see Appendix 8). The written consent form provided clear details of the study intent and asked participants to identify their level of participation in the research. The form also included clear information about the participant's ability to withdraw from the research at any time without consequence. No participants withdrew from the study.

Involvement choices	Type of consent form
Observation by WCCAT, audit	Process consent (O'Neill 2003)
Safety Attitudes Questionnaire (SAQ)	Implied consent (O'Neill 2003)
Focus group and interviews Action Research Team (ART)	Active, written consent (O'Neill 2003)

Table 3-6 Summary of involvement choices and types of consent

Nurses were provided with an information sheet and attended information sessions prior to commencing the study. The information sheet (see Appendix 4) outlined the purpose of the research, the data collection procedures, and participants' rights during the research process. The information sheet covered the benefits and potential risks participants might experience from the research, and outlined the contact information of both the health facility and university ethics committees.

3.9.4 Data management & storage

In this research, all de-identified data was stored in password-protected computer files. The research assistant, the supervisor, other researchers in the team and myself had access to the files. The ART nurses did not have access to this file, due to the sensitive nature of some of the data. The ART members had access to (anonymous and de-identified) data from Phase One while they were still part of the ART, as part of the research process. The nurses were given a hard copy of the data sets during the AR meetings and they handed these back at the end of the meeting, to avoid any loss of the data and to ensure the data was kept in a secure place. All printed sources of information were kept in a locked and secure filing cabinet. To prevent data loss, data backups were regularly performed and stored by myself and the research assistant.

All research data will be stored for a minimum of five years after the research is completed. This is consistent with the guidelines from the Australian Code for the Responsible Conduct of Research (National Health and Medical Research Council 2007), requiring all research data to be retained for reference for a minimum of five years after completion of research.

Currently, my supervisors and I are the only persons who will have access to all types of research data, both the soft files and printed documents.

3.10 Rigour

AR has been criticised as lacking in rigour, due to studies being small-scale within a particular setting (Froggatt & Hockley 2011). This may limit the application of the findings in other settings, or the generalisability of the findings. On the other hand, ensuring rigour in the research process enables concepts and principles to emerge that can be translated into different contexts (Creswell & Clark 2007). Rigour in AR projects is required, to develop more effective strategies for participant engagement and empowerment (Lennie 2006).

The term rigour has been replaced with 'trustworthiness' in social science research (Tobin & Begley 2004). Trustworthiness has a similar meaning as validity in traditional research (Rolfe 2006). Guba and Lincoln (1989) propose that the criteria of 'trustworthiness' is more appropriate than traditional scientific criteria, for assessing the quality of their 'fourth generation evaluation' action research method. This evaluation methodology is underpinned by a philosophical and constructivist framework, in which evaluation is seen as leading to social action and change (Lennie 2006). Their trustworthiness criteria are: credibility, transferability, dependability and confirmability (Guba & Lincoln 1989). This criteria will be used to outline the trustworthiness in this research study.

Credibility

Credibility testifies that the research findings can be trusted. This criteria is used to determine if the research is genuine, reliable and authoritative (Liamputtong 2009). In AR, where the researcher seeks the participation of stakeholders over a number of years, effective participation and ongoing communication with staff are also required to improve the credibility and trustworthiness of the research (Lennie 2006). Credibility of this study was achieved using several strategies, such as prolonged engagement and persistent observation. I started to engage with the participants from Phase One in the recruitment process, before the commencement of the research, and personally invited them to participate in the research. This prolonged engagement with the staff allowed a trusting relationship to be developed, which helped to decrease the motive for deception or withholding information from the participants. It is noted that the longer the time spent in the field with participants, the more accurate the data collected will be (Liamputtong 2009).

The engagement with staff occurred through information sessions, ART meetings, observations, interviews and focus groups. The regular and continuous follow up with ART nurses and other staff in all stages of the AR process increased the trust in the relationship between myself and the nurses, which in turn facilitated their engagement in the research. The communication method used to engage with participants and relevant stakeholders was face to-face communication, and communication via email, phone and conferencing systems.

Transferability

Transferability refers to the generalisability of the inquiry. The transferability of research findings is measured by other researchers, according to the information they obtain about the context or situation of this research (Lennie 2006). This criterion has been addressed by providing a thick description of the research project, to assist the future reader to determine the research context similarities and differences to their own context (Liamputtong 2009). The full description of this project can be found in this thesis and

describes the phenomenon being studied, along with a full and comprehensive literature review. Also, detailed information about the research process is provided, including the justification of chosen methods and data analysis procedures, followed by the findings from each AR phase. All this information can be used by the reader to determine the transferability of these findings to their own setting.

Dependability

Dependability refers to the stability of data over time (Connelly 2016). It asks whether the research findings fit the data from which they have been derived (Liamputtong 2009). Procedures for dependability include maintenance of an audit trail of process logs and peer-debriefings with a colleague (Connelly 2016). In the audit trail, the processes of the research method, data collection and analysis within the study should be reported in detail, thereby enabling a future researcher to repeat the work (Liamputtong 2009). In-depth coverage of the research activities also allows the reader to assess the extent to which proper research practices have been followed (Connelly 2016; Shenton 2004). In this chapter, I have documented in detail the choice of methodology and the methods of data collection, describing the context of the research and the participants. All activities that occurred during the study and decisions about aspects of the study, such as who to interview and what to observe, were also described in this chapter. The research process, data collection and analysis were also checked and audited, primarily by my PhD supervisors, and also by other research team members and the broader research team. The data collection, analysis and results were compared and matched with other research team members, to ensure correct proper research activities were followed.

Confirmability

Confirmability attempts to show that findings, and the interpretations of those findings, do not derive from the imagination of the researchers but are clearly linked to the data (Connelly 2016). Reflexivity is used to ensure the confirmability, the integrity of the research, and the nature of knowledge that AR claims (Lennie 2006). Reflexivity refers to the ability of a researcher to explicitly acknowledge that the research setting and the

researcher impact on each other (Liamputtong 2009). Throughout this study, I have been aware of the need for reflexivity and the use of a reflective journal, which has assisted with this process (Creswell & Clark 2007). While analysing the data, the researcher's self-awareness and ability to engage in critical self-reflection has been used as a strategy to minimise against potential biases and predispositions that may have affected the research process and subsequent findings (Connelly 2016). Chapter Six provides more details of my reflexivity within this project, along with examples of the reflective journal.

3.11 Summary

The aims of this study were to engage nurses (in a paediatric hospital ward in Sydney) in a research team to:

1. Identify the barriers and facilitators to safe medication practice,
2. Develop targeted interventions to reduce medication errors,
3. Implement and evaluate targeted interventions developed by nurses to improve medication safety, and
4. Understand how nurses engage in research and lead a change in practice.

To achieve these aims, AR was chosen as the research approach for this study for three reasons: it enables the facilitation of improving practice, it aims to improve practice in a particular setting, and the participatory elements of AR allow for active involvement of nurses in the research, allowing them to be actively a part of the practice improvement. This may lead to increasing the awareness of nurses and empowering them to be part of this research. Action research is considered a democratic process, essentially aimed at both taking action and creating knowledge or theory about the action.

An AR design involves mixed method data collection. This research collected data from multiple methods, including observation of practice, audit, review of medication errors rates, focus group sessions, questionnaire (SAQ), semi-structured interviews, ART meetings, and reflective notes. Qualitative data was thematically analysed, quantitative data was analysed by descriptive analysis, and the SAQ was analysed as per the instrument instructions. The participant's confidence in the research process was ensured,

through the use of consent forms, an information sheet, confidentiality of their data and de-identifying their names.

Synthesis of the study data enabled an understanding of what happened during this AR. The findings of the research study are presented in the following chapter.

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Chapter 4 Results

4.1 Introduction

While the previous chapter outlined the methodological considerations for this research, the findings from each of the three phases of this Action Research (AR) are presented in this chapter. In the first phase, which is about identifying the barriers and facilitators of safe medication practice, the observations, focus groups and audit tool were combined, and presented in a paper published online in 2017, in Comprehensive Child and Adolescent Nursing (CCAN). The paper is presented in its published format with the permission of CCAN (see Appendix 9). Other results related to Phase One include the Incident Information Management System (IIMS) and the Safety Attitudes Questionnaire (SAQ), which were not part of the published paper and are presented in this chapter, after the paper.

Phase Two relates to two specific components, a) developing and implementing targeted interventions to reduce medication errors, and b) engaging the nurses in the research process as participants. Firstly, a journey map that emerged from ART meeting minutes and ART nurse's self-evaluation questions will be presented. The results will show how the ART nurses analysed the data, and how they developed and implemented the interventions. The ART nurses led the development and implementation of the interventions, with support from myself and the other researchers in the ART. Secondly, the ability of the ART nurses to take a lead in the ART, and their experience of their involvement in this research, were explored in semi-structured interviews. The themes that emerged from these interviews are presented in this phase.

The results of Phase Three (post-implementation), including the observations, focus groups, audit, SAQ and IIMS, are presented and compared with the results of Phase One, to evaluate the overall effectiveness of the implemented interventions. In addition, eight semi-structured interviews were conducted with nurses on the ward (who were not part

of the research team), to explore their perceptions of practice changes and if they have observed any improvement in medication practice since the start of the project. An overall summary of the chapter will also be provided.

4.2 Findings from AR Phase One (pre-intervention)

The aim of this phase is to explore the overall picture of medication practice and the perception of nurses about the safety culture in their ward. The overall results of this phase identified the barriers and facilitators to safe medication practice. The workplace and medication practice observations (n = 11), the medication policy audit (n = 13) and the focus group (n = 4) results were presented in a paper. Incident Information Management System (IIMS) data (2008-2013) and the Safety Attitudes Questionnaire (SAQ) (n = 37) will be presented after the published paper.

4.2.1 Second Paper: Paediatric Nurses' Perceptions of Medication Safety and Medication Error: A Mixed Methods Study.

Alomari, A., Wilson, V., Solman, A., Bajorek, B. & Tinsley, P. 2017, 'Paediatric Nurses' Perceptions of Medication Safety and Medication Error: A Mixed Methods Study', *Comprehensive Child and Adolescent Nursing*, vol. 41, no. 2, pp. 94-110.

ABSTRACT

This study aims to outline the current workplace culture of medication practice in a paediatric medical ward. The objective is to explore the perceptions of nurses in a paediatric clinical setting as to why medication administration errors occur. As nurses have a central role in the medication process, it is essential to explore nurses' perceptions of the factors influencing the medication process. Without this understanding, it is difficult to develop effective prevention strategies aimed at reducing medication administration errors. Previous studies were limited to exploring a single and specific aspect of medication safety. The methods used in these studies were limited to survey designs which may lead to incomplete or inadequate information being provided. This study is Phase One in an action research project. Data collection included a direct observation of nurses during medication preparation and administration, audit based on the medication policy, and guidelines and focus groups with nursing staff. A thematic analysis was undertaken by each author independently to analyse the observation notes and focus group transcripts. Simple descriptive statistics were used to analyse the audit data. The study was conducted in a specialised paediatric medical ward. Four key themes were identified from the combined quantitative and qualitative data: (1) understanding medication errors, (2) the busy-ness of nurses, (3) the physical environment, and (4) compliance with medication policy and practice guidelines. Workload, frequent interruptions to process, poor physical environment design, lack of preparation space, and impractical medication policies are identified as barriers to safe medication practice. Overcoming these barriers requires organisations to review medication process policies and engage nurses more in medication safety research and in designing clinical guidelines for their own practice.

Introduction

Medication errors have been defined as "any preventable events that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the healthcare professional, patient or family" (NCCMERP, 2005). The risk of medication errors is higher in paediatric patients with potential adverse drug events three times more common in this population than in adults (Kaushal et al., 2001). Paediatric dosages are usually calculated individually based on the patient's age, weight, and body surface area as well as his/her clinical conditions. This means each drug dose is variable, placing them at greater risk of error such as a misplaced decimal point resulting in a tenfold dosing error (Chua, Chua & Omar, 2010). In addition, medication errors in paediatric patients are more likely to lead to severe or fatal consequences when compared to adult patients (Chua et al., 2010). Rates of all types of medication error in paediatric patients are reported from 3.9%, as a conservative estimate, to 36.5% (Ozkan, Kocaman, Ozturk & Seren, 2011). The rate of error may be higher due to non-disclosure (Ozkan et al., 2011). The wide variation in error rates may be explained by the lack of conceptual clarity about what contributes to an error (Osborne, Blais & Hayes, 1999; Stratton, Blegen, Pepper & Vaughan, 2004), the different approaches to defining errors, as well as the differences within the reporting cultures, that is, blame culture (Keum Soon, So-Hi, Jin-A & Sunhee, 2011). Errors that are associated with the administration of medications are reported to occur in more than 25% of paediatric patients (Keers, Williams, Cooke & Ashcroft, 2013).

The entire process of prescribing, transcribing, dispensing, and administering medication involves a multi-disciplinary team of healthcare professionals. Nurses are primarily responsible for the administration of medications and therefore the rate of medication error is higher for nurses compared to doctors, pharmacists, or other healthcare professionals (Keum Soon et al., 2011). It is estimated that nurses may spend a minimum 16% of their time preparing or administering medication (Garrett & Craig, 2009), and can administer 50 medications or more during a shift. Due to the high frequency of medication administration and the demanding nature of their role, nurses are noted to be at high risk of involvement in medication administration errors (Sears, O-Brien-Pallas, Stevens & Murphy, 2013).

Although there have been multiple attempts to reduce medication errors in the paediatric setting (e.g. adding new technology such as bar coding and providing additional education), sustainable and effective solutions for administration errors are not obvious. Strategies to reduce medication errors need to be more comprehensive, should include a review of organisational systems and procedures that support safe administration practice, and be inclusive of key people such as nurses (Alomari, Wilson, Davidson & Lewis, 2015). It is essential to understand nurses' perceptions as to why medication administration errors occur and ways in which they can be addressed (Alomari et al., 2015). Without this understanding, it's hard to develop effective prevention strategies aimed at reducing medication administration errors (Keum Soon et al., 2011).

Background

Few studies have explored nurses' perceptions of the medication process (from preparation to administration) and the factors that may influence the process. Studies have been limited to exploring a single and particular aspect of medication safety, for instance, the nurses' perception of medication errors (Blegen, Uden-Holman, Wakefield & Wakefield, 1998), meaning of medication errors (Blegen et al., 1998; Osborne et al., 1999), contributing factors for medication errors (Keum Soon et al., 2011) and relationship between the physical environment and medication safety (Mahmood, Chaudhury & Valente, 2011). Methods used in these studies were limited to survey designs that are often sub-optimal and that may lead to incomplete or inadequate information being provided and therefore, little scope for nurses to reflect and report the realities of their everyday practice.

The aim of this article is to outline the current workplace culture of medication practice in a paediatric medical ward. The perception of factors affecting work practices of nurses during preparation and administration of medications and identification of potential barriers to safe medication practice are also highlighted.

Study Design

This article presents the results of stage 1 of an action research project using mixed methods. The aim of engaging participants in this research is based on an idea that involving people in the research process empowers them to work for change in practice (Blomqvist, Theander, Mowide & Larsson, 2010). Therefore, nurses, who are the participants in this study, will be provided with an opportunity to reflect on their own practice in their own context, identify and explore issues that affect them or can be affected by them, and develop interventions to address medication administration errors.

Data Collection

Data was collected from February 2014 until July 2014. The lead author of the paper is an external researcher to the ward and organisation. The researcher had a non-participant role and activities were limited to collecting data only. This approach produces a feeling of greater security for the researcher and creates less biased data (McGarvey, Chambers & Boore,1999).

The author was stationed on the ward 3-5 days a week to collect data and become familiar with the staff and ward routine (see Table 1). For three consecutive weeks, data collection included direct observations of nursing staff during medication preparation and administration, and a practice audit (developed based on the 22 checking “steps” described in the current hospital medication policy and guidelines) was undertaken. Four focus groups were conducted at a time when nurses were available to participate.

	DATA	METHOD	TIMING	DATA ANALYSIS	INTENT	TYPE OF CONSENT
A	Organisational /Environmental factors that contribute to medication safety and risk	Direct observation Workplace Culture Critical Analysis Tool (WCCAT) was utilised (McCormack et al. 2009)	February - (morning, afternoon and night shifts). Total of 40 hours.	Identify common themes and patterns Adherence, errors and trends	The first week was exploring: • ward dynamic • workplace culture ('how things are done around here') • communication between nurses inside the medication room The second week was observing nurses from preparing medications, until the administration process was complete	Process consent
B	The use of SCHN policies and guidelines (Guideline No: 1/C/06:8232-01:08)	An audit tool was developed based on the medication policy – this highlighted 22 distinct steps in the process	March - 13 audits completed ; ten in the morning and three in the afternoon.	Simple descriptive statistics - deviations in practice & non-compliance with policies	During the third week, the compliance of nurses with the medication policy was explored.	Process consent
C	Identify facilitators and barriers of safety - build on results of data already collected	Four focus groups using open-ended questions Audio-taped and transcribed	June/July Focus groups, taking 30-45 minutes each. 20 nurses participated	Thematic analysis	Explore the themes arising from A and B to gain further insight into nurses' perspective of medication errors	Active, explicit, written consent

Table 1 Study design

The three sources of data (three data sets) were used to provide different lenses on the practice context. Observing the practice of nurses gave insight into how they were working, interacting, and providing care as well as highlighting the practice environment in which they were working. The audit was looking through the lens of the practice guideline and observing the nurses' adherence to policies and the focus groups were used to explore what the nurses thought about the medication errors and the collated data, as well as their perceptions of medication practice in their environment.

Context

The study was conducted in a complex medical ward (17 beds) in a large Australian paediatric teaching hospital with 250 beds. The case mix is varied and includes children with liver and gastroenterological disease, renal disease, and endocrine and metabolic disorders. Patients in the ward required long term treatment due to their diseases, were frequently admitted to the hospital, and were on complex medication regimes.

There are 33 registered nurses (RNs), two enrolled nurses (ENs), and one assistant in nursing (AIN) employed on the ward. There are eight nurses on a typical day shift as well as on the evening shift, and four nurses on night shift. The nurses work in teams of two. Each team generally has a patient load of four to six children per day shift. All nurses on the ward were invited to participate in the study.

Despite a lack of empirical evidence that double-checking is any safer than single checking (Alsulami, Conroy & Choonara, 2012), double-checking is used across paediatric settings and it is a mandatory practice for nurses administering medication for patients under 16 years old (NSW Ministry of Health, 2013).

The dominant model of medication administration in this ward is a medicalised, ritualistic routine where medications were given at the same time as they were prescribed by the doctor. An error would not be recorded if the child refused or vomited the medication, however nurses would document that the child refused/vomited the medication in accordance with recommendations in the National Inpatient Medication Chart (NIMC) standards (NSW Ministry of Health, 2013).

Ethics

This study was approved by local Human Research Ethics Committee (LNR/14/SCHN/32) and the University of Technology, Sydney (UTS) Ethics Committee. Ward nurses were provided with an information sheet and attended information sessions prior to commencing the study. Process (observations and audit) and written consent (focus groups) were obtained.

As part of ethical conduct, nurses were informed that in case of any potential errors or if unsafe practice were observed, the researchers would step in to prevent it from happening and it would be reported using the usual process for reporting near misses. As indicated in the literature, patient safety precedes research objectives (Williamson & Prosser, 2002).

Data Analysis

Data from the three data sets were analysed separately and then collated to inform the overall results (see Figure 1).

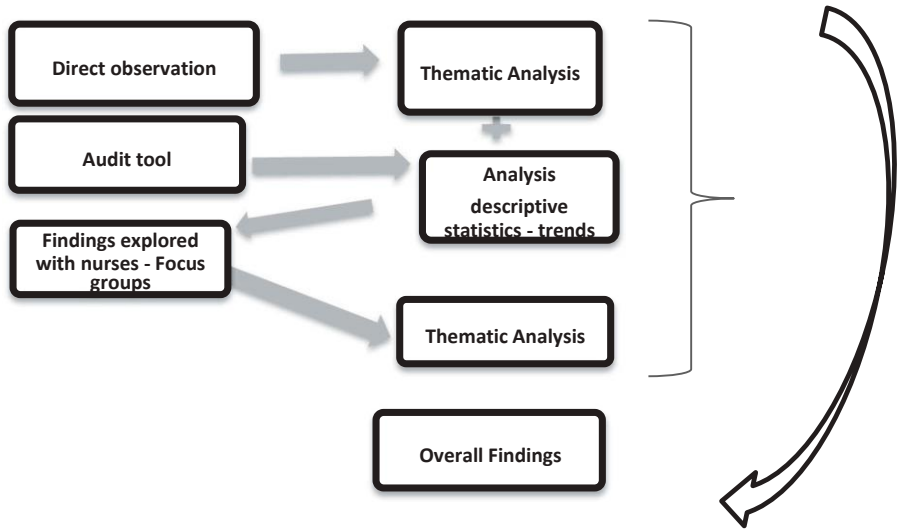

Figure 1. Data collection and analysis process.

Ward observations data were thematically analysed by each of the researchers individually and then compared. The analysis was performed by reading and re-reading the transcribed data line by line. Authors identified codes that were relevant to answering the research aims and objectives. All codes were collated with all relevant data extracts.

This was then used to identify the broader patterns of the themes. Findings were consistent across all researchers.

Data from the practice audit was analysed using descriptive statistics. The two sets of data were then combined to elicit the common trends and themes. The collated data was shared with staff and used to inform the questions for the focus groups. Staff feedback was consistent with the results obtained. Data from the focus groups (n = 4) were transcribed then analysed by the researchers individually also using thematic analysis. The results of the observations, audits and focus groups were then collated to inform the overall themes (see Figure 1).

Results

A summary of observational data obtained in week one is presented to provide a general picture of the ward practice and environment and to set the scene for medication practice. The focus of the observation in the first week includes timing, resources to support medication administration, and the communication between nurses.

Observing the Scene

Medication activities are undertaken throughout the day according to the ward's "daily structure" (shift changes and breaks). However, there are two main medication timeframes where the bulk of medications are prepared and administered (8–10 a.m. and 19–21 p.m.). These times occur immediately after the morning shift change-over and prior to the night shift change-over. The doctor's ward rounds and the pharmacy chart reviews take place each morning at the same time as the morning medication administration period.

Nurses are required to comply with five rights of medication: right drug, right dose, right time, right route, and right patient (Shah, Thapar, Jani & James, 2011). Nurses' implementation and adherence to the Medication Management and Handling Policy was observed. This policy is created and implemented by the hospital and covers all steps in the medication process, from prescribing through the completion of administration. The policy states that two registered nurses are required to double-check the whole medication administration process, from preparation to administration at the bedside.

The participating ward accessed two rooms for the preparation of medication: the "medication room" and the "Intravenous and Total Parental Nutrition (IV-TPN)" preparation room. Most activity occurs in the medication room ($4m^2$), which is much smaller than the IV-TPN room ($12m^2$). The medication room contains medications, syringes, medication administration cups, and related items, organised and labelled shelves, medication storage fridge, reference books (e.g., Australian Injectable Drugs Handbook [AIDH]) and a calculator. This room is often congested with many staff (up to six nurses) simultaneously preparing doses of medications resulting in high levels of environmental noise and impacting communication processes.

Key issues in relation to a patient's medication management are communicated verbally during "handover" (at the change of each shift). A written handover sheet provides brief points on any significant medication management issues, as well as other essential clinical information. The handover sheet contains notes on whether medication education may be required for the patient or parent. Written records (i.e. changes to policies, guidelines) are displayed on the door of the medication room.

Having set the scene for medication practice in the ward, the collated results across the three data sets (observations, audit, and focus groups) are now presented. Four key themes emerged from the combined data: 1) Understanding medication errors, 2) The busy-ness of nurses, 3) The physical environment and 4) Compliance with medication policy and practice guidelines. Direct quotes from focus groups (FG), excerpts from observer notes (ON), and data from the audit tool (AT) are used to highlight the findings.

Theme 1: Understanding Medication Errors

While nurses recognised that medication errors were an issue on the ward and attention needed to be paid to them, most indicated that serious errors seldom occurred. Less serious errors, however, did happen and to some extent, were considered a part of day-to-day practice as these nurses indicate: *"mistakes happen" (FG1)* and *"we're only human" (FG2).* This conveyed a sense of vulnerability as if they were powerless to prevent these errors happening, as well as a defensive declaration when one did indeed occur.

It was evident from the data that although the majority of nurses understood that "missed doses" were the most common type of medication error, they did not explicitly consider missed doses a reportable error. In other words, nurses did not perceive the "error of omission" (missed dose) to be as significant as the "error of commission" (wrong dose, overdose). While the error of commission would be reported, they tended only to report missed dose errors that had the potential for severe outcomes. They considered errors that caused the minimal side effect as less important and therefore were less likely to report them as indicated by this nurse*: "I think the minority error is the stuff that gets forgotten, the errors that give people a scare is the stuff that gets filled in" (FG1).* There was a lack of clarity for staff about what constitutes an error and what should and should not be reported. When considered a "minor" error, nurses would accept this as part of their everyday practice, normalising it and therefore failing to see it as an error. It was therefore clear that data from the incident reporting system did not actually reflect the reality of medication practice or the actual rate of errors that were occurring in the ward.

Theme 2: The Busy-ness of Nurses

The data revealed that a significant amount of the nursing time on the day shift is spent on the medication process and related activities as indicated here: *"We spend most of our time in medication; it takes 50–70% of our time each shift" (FG4).*

Medication administration also created a lot of busy-ness during the ward's peak medication times. The requirement for two nurses to double check every drug (as per the policy) has resulted in the medication room being crowded during these times as illustrated in this excerpt from observer notes in week 1: "*Seven nurses and students simultaneously working to prepare medications for their patients, reaching over and around each other, as well as talking over one another" (ON)*. Adding to this hectic visual scene was the requirement for two nurses to double check every drug (as per the policy) resulting in overcrowding in the drug room as well as a sense of urgency to get the work done. A lack of nurses available to double check during these peak medication periods was *noted: "we need to find someone you can't start dispensing or mixing or anything like that without anybody else there" (FG3).* This often led to delays in medication administration: "*so you have to wait and find someone and the first available" (FG3).*

Another contributing factor was the level of interruptions nurses encountered during the medication process (e.g., phone calls, patient/parent needs, and changing shifts) which added to the overall time pressure. In addition, the medical rounds and the pharmacy chart reviews took place at a similar time each morning (during the peak morning drug administration time), which resulted in further delays and distracted nurses from the medication process: *"Doctor interrupted and prescribed a medication—he spoke to nurses" (ON).*

Several nurses stated that doctors should be more proactive in ensuring that clear documentation for active medication orders are available on the medication charts without nurses having to prompt them to do so. This contributed to the nurse's sense of busy-ness as they chased orders and increased the time they spent preparing medications. *"Getting meds re-charted is a bit of an issue, some of the doctors don't re-chart them in time, and you have to chase them half the day to get them re-charted" (FG3).*

Each of these aspects influenced the medication landscape, making it a hectic and time-consuming activity for nurses with little room for practicing in a safe and deliberate manner.

Theme 3: Physical Environment

The physical context of the ward played a significant role in medication preparation and overall safety as indicated above when taking into account the busy-ness created by so many nurses: *"Seven nurses and students" (ON) in such a small space (4m^2)*. The challenges were almost exclusively related to:

- Lack of space in the medication room (where most medications are prepared)
- Lack of resources in the medication room (e.g. calculators, reference books)
- Essential supplies kept outside the medication room (e.g. computer)

The data strongly indicated that a lack of space in the medication room was a major concern for nurses as noted in this quote: *"if everyone needs bench space it's hard and you do need bench space, like I find a lot of the time if someone's standing let's say in front of the drug cupboard, they also seem to be blocking the access to all the oral*

syringes as well and so then you're also interrupting them to try and get like a syringe and then the medication would not be given on time" (FG2)

Lack of resources in the medication room is another concern: *"one calculator in the medication room and MIMS book is very old and missing some pages" (ON)*. This lack of resources and absence of a computer often resulted in nurses having to wait their turn or leave the medication room to access the resources elsewhere as indicated by this nurse: *"That's another issue with the fact that the MIMS is in the drug room it's half gone, you have to leave the drug room to look anything up so you might need to check something or wonder what this is for, yeah all right I will just go out and use the computer, and then I have to wait to get a free computer" (FG3)*

It is easy to see from this data that the physical environment has a direct influence on the time it takes to prepare medications, causes frequent interruptions to the process of medication administration, and may directly impact compliance with the medication policy.

Theme 4: Compliance with Medication Policy

In this theme, the audit data is added to the focus group and observation data. As mentioned earlier, there is one medication policy in the hospital for nurses. An audit composed of 22 checking "steps" (i.e. medication management and handling) was developed to examine how nurses were working with this policy.

The 13 audits consisted of 13 pairs of nurses having their practice observed; the sampling technique was to follow different nurses each time. This resulted in 26 nurses being observed as part of the audit. Each audit involves administering between 2–5 different types of medications to one patient.

The audit results (Table 2) indicate that 100% compliance was achieved in only 5 of the 22 steps in the medication policy (27.3%) with 6 of the other steps only achieving ≤ 25% compliance.

Nurses' compliance with the five rights of medication is variable. Almost a third of the nurses failed to double check the right dose of the medication (30.7%), and more than half of the participants failed to double check the right patient/identification band (ID) band (53.8%). However, nurses did achieve 100% compliance rate in two steps of the five rights— right medication and right route—and 92.3% of medications were prepared at the right time.

The majority of nurses (84.5%) failed to follow the policy in terms of "checking one medication at one time for one patient. Nurses indicated that they did not know the policy *"Not off by heart" (FG3),* although most of them knew *"the key aspects of medication policy" (FG3).*

In addition, during the observation, it was noted that medication was not always double checked at the bedside with often only one nurse administering the medication. This result is supported by the audit data which indicated that approximately 70% of participants failed to double check administering the medication at the bedside.

Step	Medication process	Performed N (%)		
		Yes	No	N/A
1	Prepare and administer one medication for one patient at any one time	2 (15%)	11 (85%)	—
2	The same nurse must prepare, record and administer the ordered medication	12 (92%)	1 (8%)	—
3	Two nurses must independently check the medication process for all IV, IMI, SC and oral medication	6 (46%)	7 (54%)	—
4	Wherever possible, administer medication at the same/ similar time and in a similar manner to how the parent/ carer does at home	10 (77%)	1 (8%)	2 (15%)
5	Written and clear order (Right medication), if unclear, do not give	13 (100%)	—	—
6	Right medication[a]	13 (100%)	—	—
7	Right chart	13 (100%)	—	—
8	Right patient[a] (identification band), right weight and/or ideal body weight if the patient is overweight	5 (38%)	7 (54%)	1 (8%)
9	Right dose[a] Where required, the dose should be calculated by two independent personnel. If unsure, refer to available resources (e.g. MIMS, CHW drug handbook)	9 (69%)	4 (31%)	—
10	Right time[a] and date	12 (92%)	1 (8%)	—
11	Special precaution (allergies and confirm with the parents), confirm both brand and generic names, check dilution and administration rate for IV medication and DOUBLE CHECK pump settings	3 (23%)	10	—
12	Right route[a] (as prescribed in the medication chart) e.g. oral medications that require a syringe to deliver the medication MUST be in an oral syringe. IV access must be checked prior administering the IV medication	13 (100%)	—	—
13	Does the medication require double-checking ? (if unsure, check with team leader or look it up) (IV, IMI, SC16, oral and rectal & vaginal drugs)	13 (100%)	—	—
14	For IV medication, the medication is taken to the patient in an individual tray by both the administering and checking nurse	3 (23%)	5 (38%)	5 (38%)
15	Explain clearly what is happening to the child and/or their carer	1 (8%)	11 (85%)	1 (8%)
16	Two nurses must witness administration of the medication and sign the medication chart upon completion of administration	4 (31%)	9 (69%)	—
17	Ensure privacy and comfort of the patient	10 (77%)	3 (23%)	—

18	All additives solutions prepared must be accurately and adequately labelled	2 (15%)	—	11 (85%)
19	Equipment taken to the bedside is taken away at the end of the procedure and discarded appropriately	11 (85%)	2 (15%)	—
20	If IV medication is administered over a period of time, maintenance of the infusion may be carried out by more than one nurse with adequate handover	2 (15%)	1 (8%)	10 (77%)
21	Withheld or missed doses are documented on the medication chart using the code on the medication chart	—	—	13 (100%)
22	Two nurses must witness and sign the medication chart upon completion of administration	3 (23%)	10 (77%)	—

Table 2 Audit results of 22 checking steps

Also, 77% of nurses tended to sign the Medication chart before witnessing the administration and therefore were noncompliant with this step of the administration process. Nurses justified their practice by stating that they had to take shortcuts and be non-compliant with medication policy because of the busy-ness of the ward and staff shortage as highlighted in the quote below:

"Medication administration double-checking does not happen every time and sometimes I have to administer medication on my own because it works out that way because I can't find someone to check with me at the bedside" (FG4)

At times, nurses appeared to be unconcerned when they did not fully comply with the policy: "*One RN went to the patient room with oral tablets; both the mum and the patient are asleep. The RN left the medication tray on the bedside table and left the room" (ON).* When the observer approached the nurse (as part of ethical research conduct) to highlight the risk of this practice, the nurses replied: *"it is just Panadol," (ON)* thereby minimising the consequences by indicating it was a low-risk drug commonly used for children. Without a shared understanding of what defines an error, nurses were only seeing part of the medication error picture, which resulted in them being, at times, non-compliant with medication policy.

In summary, the data reveals that medication safety is influenced by the interaction of multiple factors as indicated by each of the four themes (Figure 2). These include regulatory environment, management policies and procedures, work culture, and physical

environment (Mahmood, Chaudhury & Gaumont, 2009). These factors have the potential to negatively impact nurse's compliance with policies and guidelines.

Discussion

This study has highlighted that numerous factors contributed to creating an environment that is not always conducive to safe medication administration practice. Results demonstrate that medication errors are heavily influenced by limitations of the physical working environment and impacted by others who are focused on their own routine and work requirements, for example, doctors and pharmacists. There is an awareness of the need to follow policy, however, this requirement is often overridden by the need to get the medication to the patient within the desired timeframe. Therefore, nurses were observed to take "short-cuts" and rationalised their choices in following the process or not. Although nurses are encouraged to utilise medication protocols and to avoid interruptions, the reality of time pressures and excessive workloads cause them to modify protocols, resulting in error-prone situations (Kim & Bates, 2013). Subjective norms are determined by social expectations to accomplish or not accomplish behaviour (Ajzen, 1991). This includes patients' expectations, organisational expectations, departmental guidelines or policies, or a professional code of conduct which guides the actions of nurses (Amalberti, Vincent, Auroy & de Saint Maurice, 2006).

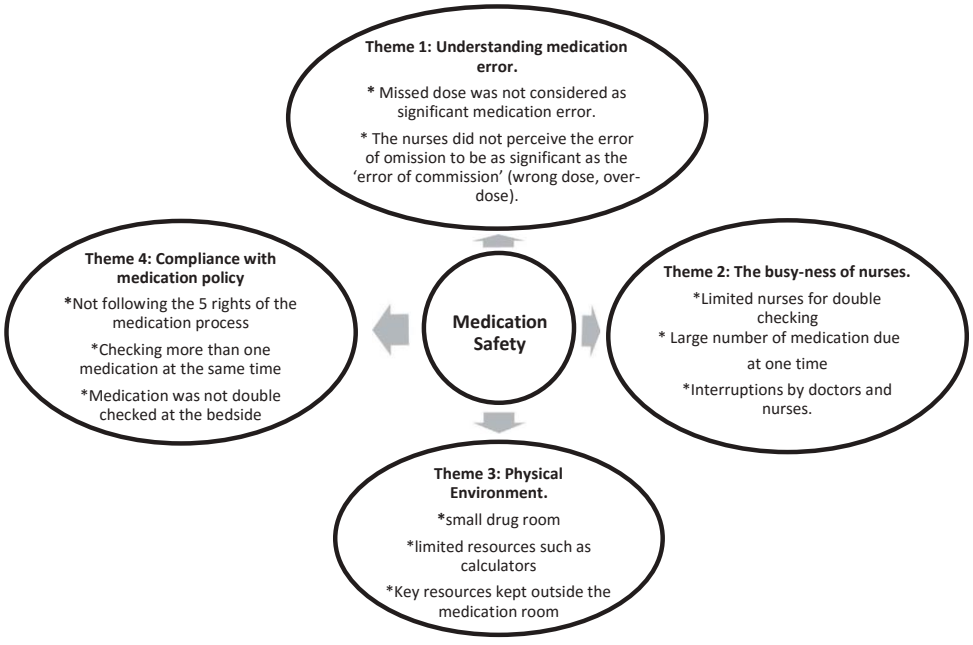

Figure 2. Summary of the results.

The nurses in this study appear to have recalibrated their sensitivities as to what constitutes a medication error and do not report all errors. Previous studies have found that the reasons for non-reporting of medication errors are that they are either not detected, hidden, easily fixed, or because there is fear of the consequences of reporting (Prot et al., 2005). In our study, nurses failed to report what they considered a minor error, even though this is against the hospital policy. Alternatively, nurses preferred to follow up on errors personally with each other as opposed to reporting them (Prot et al., 2005). The theory of planned behaviour relates to the non-compliance of protocols to individuals' willingness to break rules and the likelihood of detection and of consequences (Cabilan, Eley, Hughes & Sinnott, 2016). The theory also states that non-compliance is determined by the individual's assessment of the outcomes, the social influences on them, beliefs about control, and personal moral codes and beliefs (Amalberti et al., 2006). One particular research study referred to this deliberate deviation from standard instruction as a "violation" (Amalberti et al., 2006). Nursing staff in this study have demonstrated behaviours that violate or breach the policy in various situations. They have come to see the current situation as the norm although they do acknowledge that it is not desirable. For instance, they fail to always double check medication at the bedside in order to avoid any delay in the medication administration process, which in itself (delayed administration) can be deemed to be an error. In other words, they fail one part of the process (double-checking at the bedside) to avoid a breach in another part of the process (delayed administration).

Causes of breaching the standards may relate to organisational and cultural factors. Vincent & Amalberti (2016) associated breaching the standards in any organisation to the working conditions and the physical environment (Vincent & Amalberti, 2016). More specifically, where the pressures are higher, the environment is noisy and chaotic, and there's less use of resources, it forces nurses to take shortcuts because they are mostly just trying to do the best they can in these circumstances. Additionally, Armitage & Knapman (2003) found that a lack of appropriate, comprehensive, and practical policies and guidelines can lead to violating the standards. Although evidenced-based policies enhance the quality of care by reducing variation into practice (Rycroft-Malone, Fontenla, Bick & Seers, 2008), they must have the scope to identify and address the complexities of the environment; otherwise, nurses will "work around" the policy, thereby violating

the standards. In the current study, the medication policy did not take into account workplace reality and the medication practices of the ward, e.g. the policy requires nurses to administer one medication to one patient at one time, which would result in nurses administering multiple medications to one patient, taking even longer to complete them.

As a result of breaching standards over a period of time, the healthcare team often does not recognise the extent to which its behaviours contribute to the potential error because these departures from policies and guidelines can become increasingly tolerated and eventually invisible (Vincent & Amalberti, 2016). Over time these breaches of the standard can become more frequent and more severe so that the whole system "migrates" the boundaries of safety (Rasmussen, 1997). Breaching becomes so routine and commonplace as to be almost invisible to both workers and managers. At this stage, any further deviance may easily result in patient harm, and would generally be considered negligent or reckless conduct (Amalberti et al., 2006).

Healthcare systems are a particularly complex environment and breaching the standards cannot be eliminated, but they can be managed (Amalberti et al., 2006). Hence, the management of breaching must begin at the clinical level with ongoing discussions between staff regarding standards of safe practice and how to manage acceptable and unacceptable deviations from the "rules." When it is clear that breaching is, in fact, adaptive, then procedures may need to be adjusted to reflect this. Strategies to emphasise the detection of problems, awareness of conditions which influence safety, and enhance team-based management of potentially harmful care must be employed (Vincent & Amalberti, 2016). A dialogue between nurses and managers is crucial to establishing a shared safety culture (Nelson, Cook & Ingram, 2014).

It is important to engage bedside nurses as key stakeholders, ensuring their perspectives are heard and they can share ideas on how medication errors can be reduced. This approach would benefit from "working with" staff rather than "working on" staff to develop ideas for enhancing medication safety and reducing medication errors. This approach is being used in the second phase of this study. The most expedient way to enable nurses to challenge traditional practice is to involve them in the change process (Jacobson, Warner, Fleming & Schmidt, 2008). Nurses should be included in the

development and implementation of patient safety initiatives and developing/changing policies and guidelines. Research should consider involving clinical nurses in medication safety projects, not just as participants but as active stakeholders with vested interests in the outcomes of the research.

The study has a number of limitations. First, in the direct observation method the observer can have an effect on the person being observed and may introduce study bias and social desirability. However, this Hawthorne effect (Dean & Barber, 2001) seemed to disappear after a few days of observation, as the person being observed tended to forget about the study and return to his/her their "normal" behaviour. This was noted because the nurses stopped questioning the researcher's presence in the ward. Second, the study was conducted in one paediatric ward, which may influence the transferability of the results to other contexts. Study strengths include the environmental context of information and multiple data collection methods.

Conclusion

The barriers to safe medication practice are numerous and interrelated. Workload, frequent interruptions to process, poor physical environment design, lack of preparation space, and impractical medication policies are not only affecting safe medication administration but also forcing nurses to adapt and deviate from safety regulations. Overcoming these barriers requires organisations to review medication processes and policies critically, and to highlight the difference between the evidence (the policy/guidelines) and practice (what happens in reality). Nurses are at the centre of these work practices and should be participating in future medication safety research and in designing clinical policies and guidelines for their practice. Translation of key messages may inform and enable other healthcare services to review their medication safety culture and nursing practice. These results will form part of an action research approach where nurses will work alongside the researchers and parents to fully understand the current context of practice and the evidence collected to date in relation to medication administration practice. By working together, the aim is then to identify and implement potential solutions to overcome the contributing factors that are currently impacting medication administration safety.

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In addition to the combined results of practice observations, focus groups and the medication policy audit presented in the published paper, the results of the IIMS and SAQ are presented in the two following sections.

Incident Information Management System data (2008-2013)

The IIMS data from 2008-2013 for the ward, prior to the project commencement, indicated that the medication errors mostly occurred at the administration stage (see Figure 4-1). The ward reported a higher medication administration error rate than the organisation, with the ward error rate of 77%, while administration errors were, on average, 65% across the organisation during the same period. The second most significant medication error type recorded was prescribing, with the ward error rate of 21%, while prescribing errors in the whole organisation represented 25% of medication errors during the same period.

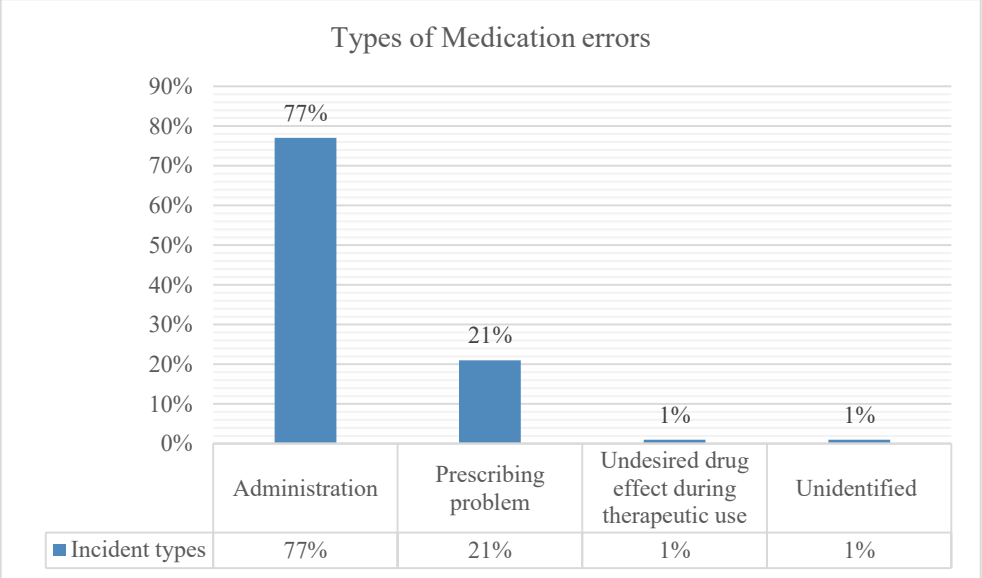


Figure 4-1 Types of medication error on the ward (2008-2013)

Across the six years, there were 241 reported medication incidents on the ward. The medication administration errors were classified into 21 different types. Omissions were the most frequent error, which represented almost a third of administration incidents (28% of administration errors). The omission errors in this data related to the medication not

being administered to the patient, without any explanation. The second most frequent administration error was extravasation, representing 8% of the total number of administration errors. The other types of administration errors, such as wrong order, wrong dose, wrong patient, and wrong timing, had similar error rates, which ranged from 10-12 errors on the ward in the period 2008-2013 (see Figure 4-2).

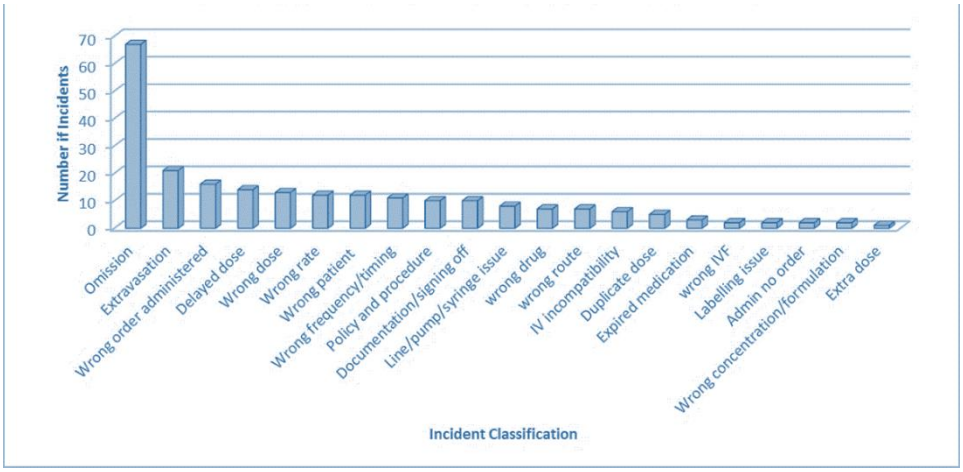


Figure 4-2 Types of medication administration errors (Phase One)

While there were 241 medication incidents reported on the ward, the time of the incident was only reported in 215 cases (see Figure 4-3). The time of the highest medication error rate (11.6% of medication incidents) occurred between 8:00 pm and 9:00 pm. The mornings, between 9:00 am and 10:00 am, and 8:00 am and 9:00 am had the second and third highest incident rates (7.9% and 7.4% respectively). These medication incident times represent the beginning of the morning shift and prior to the commencement of the night shift. During these time periods, the majority of twice daily (Bis Die [BD]) medications are given on the ward and are administered when the handover between the different shifts is also occurring (see Figure 4-3). This was noted during the observation period, when the morning time period represents not only handover between the shifts, but also a high number of nurses, doctors, pharmacists, families and patients asking nurses for their attention. This leads to a busy and chaotic environment on the ward, which may negatively affect the nurses' attention to medication safety, resulting in them not always following the required checks in order to complete medications on time.

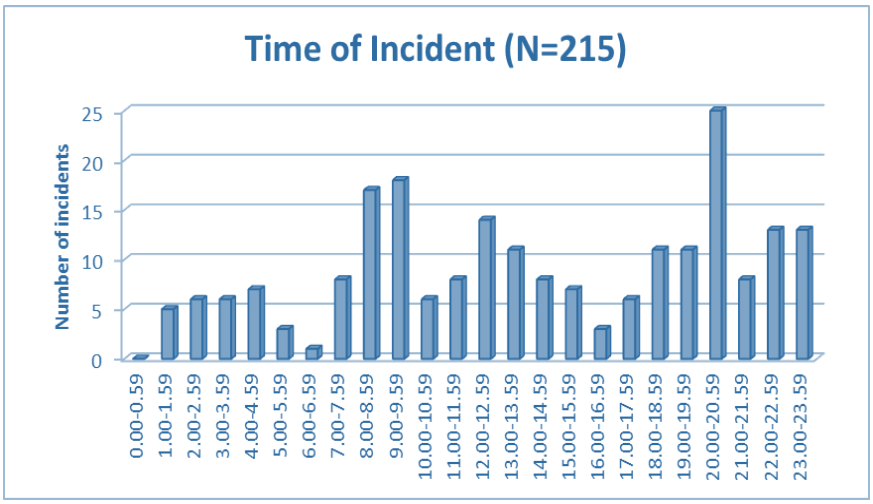


Figure 4-3 Time of medication incidents (Phase One)

Safety Attitudes Questionnaire (n = 37)

The outcomes of the SAQ provide pre-intervention and post-intervention measures of safety on the ward. A total of 37 (out of 45 staff) completed surveys were returned. The nurses, in varying roles (RNs, Nurse Practitioner, Nurse Manager, ENs and AINs) represented 62.1% (n = 23) of the respondents and in practice, represent 70% of the total number of nurses on the ward. The second highest response rate came from doctors at 21.6% (see Table 4-1 for more details). The vast majority of the respondents were female (n = 33), representing 89%, with male respondents representing 11% of the total sample.

Designation	Responses	Numbers
Doctor	21.6%	8
Registered Nurse	48.65%	18
Nurse Practitioner	2.7%	1
Nurse Manager	2.7%	1
Enrolled Nurse	5.41%	2
Assistant in Nursing	2.7%	1
Dietician	2.7%	1
Pharmacist	5.41%	2
Physiotherapist	5.41%	2
Ward Clerk	2.7%	1

Table 4-1 The demographic work profile of participants who completed the SAQ

As explained previously in Chapter Three, the SAQ has six domains and the definition of each domain is provided in Table 3-3 (page 93). The domains include teamwork climate, safety climate, job satisfaction, stress recognition, perceptions of management (hospital and unit) and working conditions. Questions under each domain were grouped and coded into these domains, and calculated into a percentage as per SAQ instrument instructions (Sexton et al. 2006). The SAQ results were presented to nursing staff using a traffic light system. The details of this scoring system were discussed in Chapter Three (page 99). The aim is to keep the domains in the green zone (over 80% positive responses). Amber zone (60-80%) indicates room for improvement and red zone (less than 60%) requires urgent attention. Figure 4-4 presents the SAQ results using the traffic light system, outlining the mean scores for each domain.

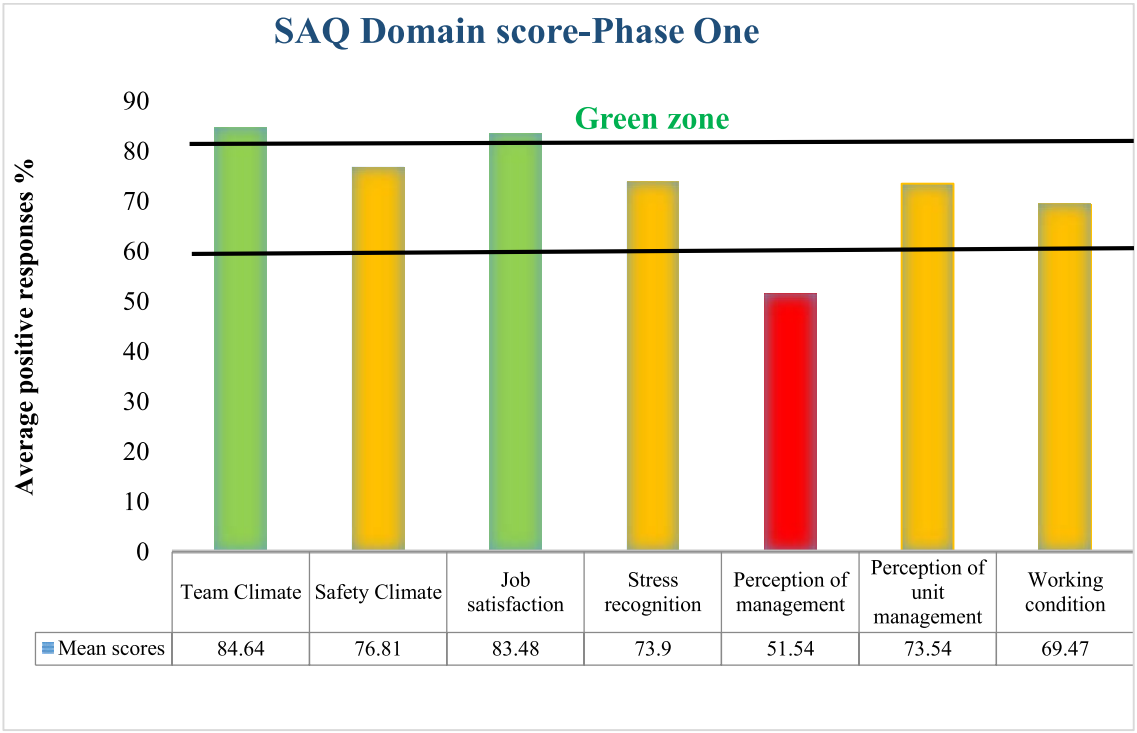


Figure 4-4 SAQ domains results (Phase One)

In Phase One, the only domain in the red zone is perception of hospital management, scoring 51.54%. Four domains (safety climate, stress recognition, perception of unit management, and working condition) sit in the amber zone with mean scores ranging from 69.47% (working conditions) to 76.81% (safety climate). The only two domains in the green zone are team climate (84.64%) and job satisfaction (83.48%). Table 4-2 shows the individual questions scores for each domain.

Teamwork climate	**2014**
Nurse input is well received in this clinical area	94.6
In this clinical area, it is difficult to speak up if I perceive a problem with patient care	80.6
Disagreements in this clinical area are resolved appropriately	60.5
I have the support I need from other personnel to care for patients	89.6
It is easy for personnel here to ask questions when there is something that they do not understand	91.6
The physicians and nurses here work together as a well-coordinated team	90.9
Average percentage	***84.64***
Safety climate	
I would feel safe being treated here as a patient	94.4
Medical errors are handled appropriately in this clinical area	84.3
I know the proper channels to direct questions regarding patient safety in this clinical area	94.6
I receive appropriate feedback about my performance	58.1
In this clinical area, it is difficult to discuss errors	63.8
I am encouraged by my colleagues to report any patient safety concerns I may have	75.7
The culture in this clinical area makes it easy to learn from the errors of others	66.6
Average percentage	***76.81***
Job satisfaction	
I like my job	89.9
Working here is like being part of a large family	81.1
This is a good place to work	91.7
I am proud to work in this clinical area	90.5
Morale in this clinical area is high	64.2
Average percentage	***83.48***
Stress recognition	
When my workload becomes excessive, my performance is impaired	75.0
I am less effective at work when fatigued	84.9
I am more likely to make errors in tense or hostile situations	78.4
Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure)	57.3
Average percentage	***73.9***
Perceptions of management (hospital)	
Hospital Management supports my daily efforts	53.2
Hospital Management doesn't knowingly compromise patient safety	53.1
Hospital Management is doing a good job	48.7
Problem personnel are dealt with constructively by our Hospital Management	50.4
I get adequate, timely info about events that might affect my work, from Hospital Management	52.3
Average percentage	***51.54***
Perceptions of management (unit)	
Unit Management supports my daily efforts	78.1
Unit Management doesn't knowingly compromise patient safety	77.5
Unit Management is doing a good job	76.2
Problem personnel are dealt with constructively by our Unit Management	58.6
I get adequate, timely info about events that might affect my work, from Unit Management	77.3
Average percentage	***73.54***
Working conditions	
This hospital does a good job of training new personnel	80.0
All necessary information for diagnostic and therapeutic decisions is routinely available to me	*70.2*
Trainees in my discipline are adequately supervised	*70.6*
The levels of staffing in this clinical area are sufficient to handle the number of patients	57.1
Average percentage	***69.47***

Table 4-2 SAQ item results

The most positive outcome in the SAQ data is the teamwork climate score (84.64%) which is in the green zone (see Figure 4-4). The teamwork climate domain is about collaboration between the team members (see Table 4-2). For instance, one question in this domain was "I have the support I need from other personnel to care for patients", and 89.2% of respondents endorsed this. However, one question in this domain is outside the green zone, "Disagreements in this clinical area are resolved appropriately", which scored 60.5%. Staff expressed positive perceptions about speaking up if they needed assistance, as demonstrated by responses to the question "Nurse input is well received in this clinical area", which scored 94.6%. Overall, this domain showed that staff are satisfied with communicating and asking for assistance in terms of patient care, but are dissatisfied with how conflict is being resolved on their ward.

The safety climate (76.8%) is in the amber zone, which is considered a risk score, and one aim of potential interventions would be to develop this area and move it to the green zone. Safety climate aims to measure the organisation's commitment to safety. Of the seven questions, three are in the green zone, three in the amber zone, and one is in the red zone. The question "I receive appropriate feedback about my performance" only achieved positive responses from 58.1% of the participants. The feedback about performance comes from ward management, which may indicate that the nurses are unsatisfied with the management's way of communication. The highest scored question (94.6%), "I know the proper channels to direct questions regarding patient safety in this clinical area", reflects the nurse's awareness about the proper channels if they have patient safety concerns.

The job satisfaction domain (83.48%) is in the green zone (see Figure 4-4). The job satisfaction domain relates to the positivity of the work experience of the participants. For example, one of the questions under this domain is "I like my job", where the participants scored 91.9%, indicating that despite some of the other areas of concern for staff, they like working in the unit. All but one question in this domain is in the green zone (see Table 4-2). The exception, which scored 64.2% and is therefore in the amber zone, is

"Morale in this clinical area is high", which is certainly something to look at in terms of improvement.

The effect of stressors on the participants, as shown in the stress recognition domain, is in the amber zone, scoring 73.9% (see Figure 4-4). For instance, only 57.3% of the participants recognised that "Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure)". In contrast, staff acknowledged that they are less effective when fatigued (84.9%). There was also less recognition that excessive workload impairs performance (75%) and tense or hostile situations increase risk of errors (78.4%) (see Table 4-2).

The results of the SAQ show that the most alarming issue is the perception of hospital management, which is in the red zone. In this domain, the staff express their dissatisfaction with their relationship with the hospital management, scoring only 51.54% (see Figure 4-4). This result likely indicates that staff have concerns regarding lack of communication from management, for example, management not providing information to staff regarding their work conditions (52.3%). Staff also reported feeling unsupported by the management of the hospital in terms of their daily efforts. Specifically, one of the questions under this domain is "I get adequate, timely info about events that might affect my work, from Hospital Management". The positive response to this question is only 52.3%. The most alarming result in this domain is to the question "Hospital Management is doing a good job", with more than half of the respondents not satisfied with management (48.7%). Table 4-2 shows that all the questions on this domain are in the red zone. These results suggest that improvements need to be made in this regard.

The participants were more satisfied with unit management, compared to hospital management. Generally, the staff showed a higher level of satisfaction with the overall unit management (73.54 %), however this response rate is in the amber zone (see Figure 4-4). Most staff (78.1%) felt supported by their manager, which is just under the green zone. However, the results also demonstrate that there are areas the NUM can improve

on to increase staff satisfaction, especially when it comes to supporting staff. For example, the question "Problem personnel are dealt with constructively by our Unit Management" scored 58.6%. This question reflects the degree of support the staff expect from unit management in relation to any staff problems that occur at the workplace. This low score is also reflected in the hospital management domain, where the same question scored 50.4%, indicating that this may be an issue across management levels in the organisation.

The working conditions domain scored 69.47%, which places it in the amber zone (see Figure 4-4) and also requires further consideration. The staff expressed their concern about the staffing level, which may impair patient's safety. This is evident in the following question, "The levels of staffing in this clinical area are sufficient to handle the number of patients", where staff scored only 57.1% (see Table 4-2). The answer to this question reflects that the staff perceive the level of workload they are facing on a daily basis on the ward is high. This domain also indicates that there is a perception of lack of support among staff, especially in terms of supervision and communication. However, the staff are satisfied with the level of training they have received from management, as shown in "This hospital does a good job of training new personnel", with a positive response of 80%.

In summary, the area of most concern, which is in the red zone, is the perception of hospital management and this requires urgent attention. The lack of support perceived by staff is mainly seen in terms of exchanging information with management, staffing levels, and working conditions. Despite this dissatisfaction with working conditions and the safety climate, the participants indicated in their responses that they are satisfied with their jobs and the level of teamwork climate on the ward, shown in the team climate and jobs satisfaction domains.

It is worth noting that the lower scoring questions across the different domains have a similar pattern (see Table 4-2). For instance,

- **Problem personnel** are dealt with constructively by our Hospital Management 50.4% (hospital management),
- **Problem personnel** are dealt with constructively by our Unit Management 58.6% (unit management),
- I get **adequate, timely info** about events that might affect my work 52.3% (hospital management),
- I get **adequate, timely info** about events that might affect my work 77.3% (unit management),
- I receive **appropriate feedback** about my performance 58.1% (safety climate),
- **Disagreements** in this clinical area are **resolved** appropriately 60.5% (teamwork climate),
- In this clinical area, it is difficult to **discuss errors** 63.8% (safety climate), and
- All the **necessary information** for diagnostic and therapeutic decisions is routinely available to me 70.2% (working conditions).

The trend across these low scoring questions is lack of communication between management and staff. The staff responses to these questions may indicate dissatisfaction with their ability to discuss errors and a sense of powerlessness, especially in cases of dealing with problem personnel. The lack of information about the events that might affect staff work may add more stress to them. These questions also represent staff dissatisfaction that they are unable to learn from their mistakes, due to lack of feedback from unit and hospital managers (see Table 4-2).

The diagnostic phase (Phase One) of this AR study highlighted that the medication administration error rate was higher on this ward than for the rest of the organisation. The results of this phase identified multiple factors that contributed to the high medication error rate. These factors include 1) the busy-ness of the ward at the handover time, as shown in the observation and IIMS data, 2) the lack of resources and small size physical environment, as highlighted in the focus groups and the observation data, 3) the lack of feedback from management, as shown in the SAQ and focus group data, and 4) the lack of information policy and impracticable steps in the policy, as shown in the audit and the

focus group data. These factors confirm the need to reduce the medication administration error, enhance medication safety, and improve nurses' satisfaction with working conditions. The results of Phase One were grouped together and presented back to the staff on the ward, during a number of feedback sessions. The aim of the feedback sessions was to present the results of Phase One in a meaningful way, to highlight the medication practice picture on the ward, and to discuss and invite nurses to join the ART.

These results formed the basis of medication practice in the ward and informed a plan for the researchers to work alongside nurses to form an ART and develop potential interventions to enhance the medication process. In Phase Two, an AR framework was adopted to ensure that key stakeholders, such as nurses, were engaged in a change process that offered the greatest potential to generate genuine and sustained improvement in practice.

4.3 Findings from AR Phase Two

The aim of this phase was to work with the ART nurses to further explore the data from Phase One, and to develop a bundle of interventions to improve the medication process and the working culture of the nurses. In this phase, the clinical bedside nurses joined the ART.

The ART meeting minutes, over the 18-month period, were analysed to explore the ART's process of:
1) Categorising and prioritising the medication issues on the ward, from the analysis of data from Phase One,
2) Asking critical questions related to their medication practice, and
3) Developing and implementing a number of interventions to improve medication practice.

These results represent the analysis of the ART meeting minutes (including the self-evaluation questions) and are presented as a journey map. The process of developing and implementing the targeted interventions by the ART nurses will also be fully described.

In addition, the ART nurses' perceptions and their ability to lead an AR project was explored. Semi-structured interviews were conducted with the ART nurses at the end of Phase Two, to explore how they were developing as researchers. Themes from the interviews with the ART nurses, regarding their experience of participating in the ART, will be also presented.

Meeting minutes

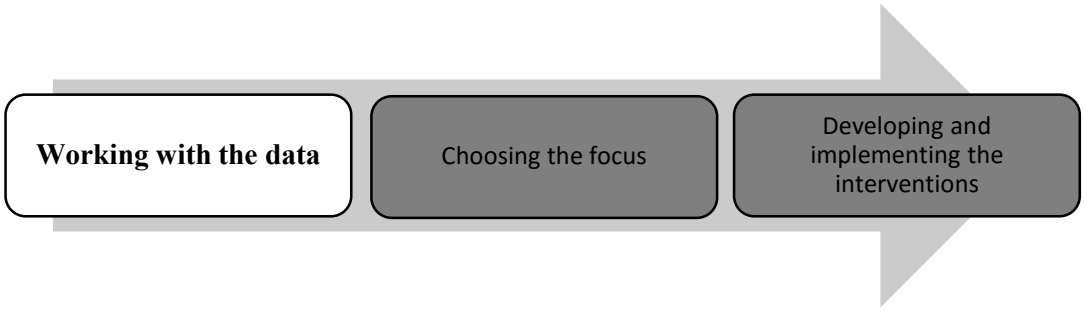
The first ART meeting was held in April 2015 and meetings took place every six to eight weeks. The ART nurses were asked to self-evaluate after every ART meeting (along with other members of the research team), by answering the following two questions, 1) how do you feel about today's meeting? and 2) what have you learned today? The meeting minutes were analysed to extract the information on how the ART nurses developed and implemented the targeted interventions.

These results show the process of developing the targeted interventions by the ART nurses. The journey map will be presented with quotes from ART meetings. An overview of the targeted interventions created and implemented by the ART nurses is provided along with the action plans of the work that was taking place on the ward.

The ART nurse's journey

The journey of the ART nurses developing the targeted interventions had three steps. The first step represented the nurses' journey in reading, analysing and reflecting on the data from Phase One, to identify the issues in practice. The second step in this journey, through critical and reflective questioning, was choosing the data that highlighted the concerns regarding medication practice on the ward. The third step was developing and implementing a bundle of interventions, to solve the issues relating to medication practice on the ward. The following abbreviations will be used: ARTM is Action Research Team Meeting, and N represents the ART nurse. Please note that pseudonyms are used for the ART nurses from Step Two.

Step One of the journey - Working with the data



In this step of the journey, the ART nurses were required (with other ART members) to review and critically analyse the results from Phase One of the project, and to identify any flaws in medication practice. This step reflects the nurses' perceptions of the data, their ability to identify the requirements to move forward in the research, and to prioritise the issues according to their ward needs. There are a number of themes identified in Step One of the journey, these are presented below.

Feeling overwhelmed (Meeting 1)

At the beginning, the ART were given the results of Phase One and were engaged in theming the data and exploring the results in more depth. The ART nurses appeared to be surprised by these results. They were shocked about the high medication error rate, as they had not expected this, especially when they found out that they had a higher medication error rate than other wards in the organisation. For example, one nurse stated *"it is shocking…we make more errors than anyone else"* (ARTM1-N1). Also, the ART were not fully aware of the picture that was emerging about medication practice. The nurses were not only unaware about the rate of medication incidents, but also were not fully aware that sometimes staff took shortcuts and did not always follow the medication policy as required, for example, non-compliance with double-checking the whole medication process *"I always thought that we had good medication practice standards, never expected that we are making that many errors"* (ARTM1-N2).

In Meeting 1, the nurses were feeling overwhelmed with the data and unsure what to do with it, experiencing it as "*Too intense at times, felt a bit knocked back at times"* (ARTM1-N2). Due to the large amount of data and the new picture of their medication practice, they appeared uncertain about how to deal with the data. The nurses were advised by the broader research team to reflect on the data and re-think how they could use it in the research, to improve the medication practice on their ward. They were encouraged to contact me if they had any questions about the data following the meeting.

Acceptance (Meeting 2)

By the second meeting, the nurses appeared to feel more aware of the current picture of their medication culture and the newly discovered flaws in their daily medication activities. They began to accept this new picture of their practice and were motivated to find solutions for the issues on their ward. Reviewing the results in more detail had improved their understanding of their medication practice, "*the data is like an eye opener for me*" (ARTM2-N3). They were more conscious of the fact that current practice needed to be changed and improved, as they had uncovered medication safety issues on their ward. The nurses also appeared confident to challenge their practice culture, as one nurse stated, "*Old practice has issues, but we can make a difference"* (ARTM2-N5). The fact that the ART nurses accepted that there were flaws in medication practice on the ward may relate to their confidence in the research process, regarding the evidence that had been collected and what they were discovering from the data. This may help explain their motivation to learn the process to address the ward's medication practice issues and act to resolve them, as commented by this nurse, *"I think this research project is very necessary to reduce the medication error rates in the ward"* (ARTM2-N1).

Developing research skills (Meeting 3)

The nurses were conscious of, and anxious about, their perceived lack of research skills. The lack of experience in research skills was still an issue for them, despite the fact that they realised that they needed to challenge the safety culture on their ward, in order to improve the medication practice. They were aware that to make a difference in their

medication practice, they needed to be equipped with research knowledge and how they could work effectively within the ART, as one nurse said, *"We need more support with the research skills"* (ARTM3- N4). The nurses showed initiative and developed their own strategies to benefit from the ART meetings, and to learn and develop their research skills and knowledge. I observed that the nurses started to take notes during the full day workshops, and they were engaging more with the rest of the team and asking critical questions about the data collection and research process. They took the initiative to ask me about research issues, such as how they might go about developing a survey, running meetings on the ward, and how to engage other ward nurses in looking at the data. For instance, this nurse asked me for help *"I need to make an appointment with you to see if you can help me with the survey"* (ARTM3- N2).

I worked closely with the nurses to support them to review and explore the data and help them to learn how to ask critical questions. The ART nurses sent me emails asking for clarification about strategies to engage other nurses on the ward. I visited the nurses regularly to offer assistance. The ART nurses also kept a record of their activities, approaches, and discussions with other nurses on the ward.

Becoming more critical (Meeting 4)

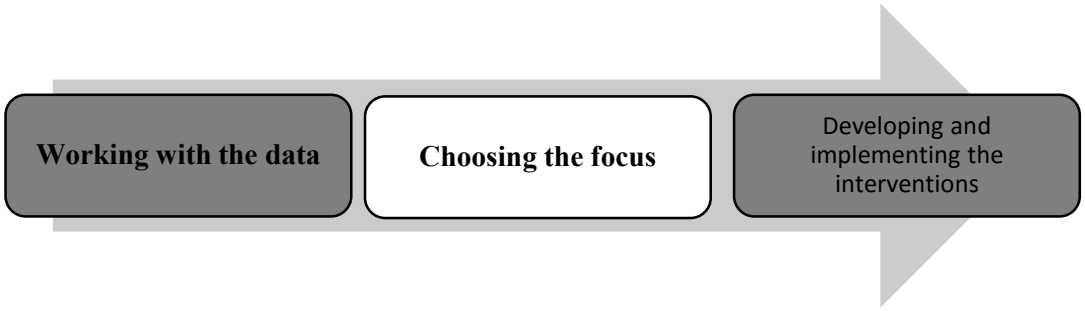
After the required support was provided to ART nurses and a few months of regular ART meetings, the nurses stated that the meetings were like "*learning venues"* (ARTM4-N4). The nurses at this stage started to realise that their participation in the ART provided them with the support and learning that they needed to move forward with their smaller projects (as part of the larger study). They were able to identify their needs in research, they engaged more in the team discussions and were benefitting from working with experienced researchers, to develop themselves as researchers, as highlighted here by this nurse, *"Working with the qualified researchers like you is very constructive and enables us to improve many research abilities"* (ARTM4-N3). They were learning the research skills they needed, *"We learned about the research process. Data collection can happen. I learned that research is not a simple process, it is hard work*" (ARTM4-N6).

Engagement and ownership (Meeting 5)

The ART nurses, at this stage, were gaining confidence and took the initiative to lead the ART work, to further explore the research questions they had identified about medication administration practice on the ward and to develop solutions accordingly. They started to formulate a picture of the problem and created a plan to enable them to progress with their research, as offered by one member, "*We have a direction to go forward"* (ARTM5-N3). The ART nurses were divided, to work either individually or in a team of two, with each person/team then selecting one question they were interested in analysing further, to find a potential solution for it by involving other nurses on the ward. Action plans were then developed and led by the ART nurses. Each team used a different method to consult and engage nurses on the ward.

The following section provides more details on how the ART nurses chose their focus and how they have explored this in their practice.

Step Two in the journey - Choosing the focus



Step Two in the ART nurses' journey was "choosing the focus" and exploring the specific issue in practice in more detail.

The nurses became more confident and skilled in identifying the main barriers to safe medication practice on their ward, and they developed four research questions, based on Phase One results. The ART nurses believed that these questions characterised the whole medication safety issues they had on the ward.

The questions were:

1) Why is the shift structured the way it is?
2) What are the nurses' understanding of the medication policy?
3) How are we engaging families in medication administration?
4) What are staff perceptions of errors and what is and is not reported?

Table 4-3 (page 174) records a summary of the ART nurses' approaches in dealing with the data, exploring the questions, and the process they followed to investigate the questions with other ward nurses.

After choosing the research question they were interested in investigating, each team or individual planned their investigation approach, consulting each other and the broader research team. They supported each other during data collection and analysis, and invited other nurses on the ward to participate in the surveys, meetings and focus groups they held. The data collection method used for each of the questions was decided by the ART nurses, in collaboration with ward nurses and the broader research team. The analysis of the data was also conducted by the ART nurses during and between the ART meetings, with the support of myself and the other ART members.

The information below details the question focus, the development process, how the ART nurses participated in exploring each question (focus), and the approach they used.

Why is the shift structured the way it is?

The results of the IIMS, observation, audit and focus group data in Phase One showed that nurses on the ward were struggling to finish their work tasks at the end of their morning shift, and by 8pm in the afternoon shift, and that this resulted in higher levels of errors at these times, as demonstrated in particular by the IIMS data. The nurses were all using the small medication room at the same time, resulting in five or six nurses in the medication room at one time, as reported in the observation and focus group data. This

chaotic scene led the nurses to take shortcuts and not follow the proper medication procedures, such as double-checking at the bedside (as shown in the audit result), which may result in more medication errors.

Lorraine and ***Sarah*** were two ART nurses who explored this problem and reviewed the shift structure, by using multiple data methods including focus groups with ward nurses (n = 6), and Fitbit data to track movements of nurses between the medication room and the bedside (see Table 4-3). They summarised and analysed the data by mapping the shift dynamic and activities. They found that the peak time for nurse's workload was at 8:00 am and before the night shift starts at 7:30 pm. The ward nurses participating in the focus group sessions stated that the small medication room and nurses rushing to finish their work before they go home created a sense of urgency that may increase the likelihood of more medication errors. The nurses on the afternoon shift believed they had to get all work completed before the night shift started. They believed it was not the night shift staff's job to do medication.

What are the nurses' understanding of the medication policy?

The results of the audit in Phase One showed low compliance with the medication administration policy. The audit results indicated that 100% compliance was achieved in only six of the 22 steps in the medication policy (27.3%). The nurses stated in the focus group that they did not know the policy fully, *"Not off by heart" (FG3)*. This led the ART nurses to review the policy in more detail, and explore the ward nurses' perception of the policy. ***Venus***, who was in the ART, chose to explore this area with ward nurses (n = 12), using a self-developed simple survey (see Table 4-3). The survey was developed to explore the ward nurse's usage of the policy and included questions such as When did they use it? How they used it? Were they aware that they needed to follow 22 steps according to the policy? The review of the organisation's policy and the survey results indicated that the nurses perceived the policy as outdated, a large and bulky document and impractical (it was over 22 pages). ***Venus*** also found that the policy was mandating that the nurses administer one medication at one time for one patient. The nurses found this step unrealistic in clinical practice, especially on their ward where many children

were on multiple medications. They indicated that this caused a higher workload and was time-consuming, especially given that this step is not an evidenced-based practice.

How are we engaging families in medication administration?

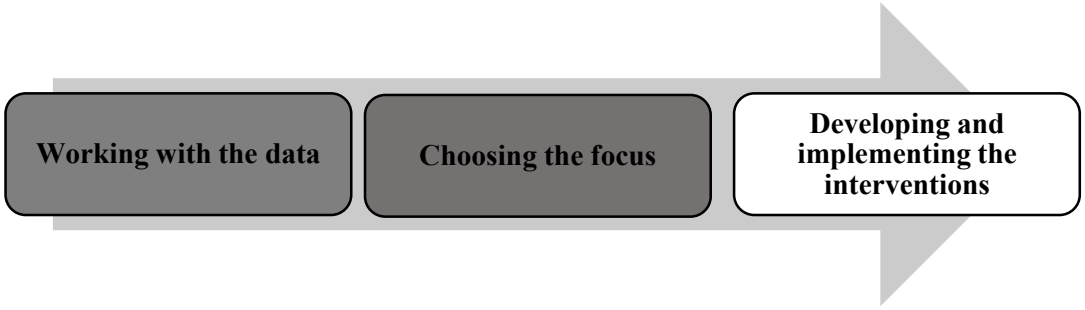
The audit result in Phase One showed lack of engagement of families in the medication process, for example, only 8% of nurses were compliant with Step 15 *"Explain clearly what is happening to the child and/or their carer"*. Also, the focus group results showed that nurses perceived families as a source of interruption, despite families being considered as part of the provision of care on the ward, due to their child's long length of stay and the nature of their chronic disease and types of treatment. Therefore, ***Lorraine*** and ***Sandra*** explored how families could be involved in the medication administration process and how they could work with the nurses to reduce administration error? To answer this question, they conducted four focus group sessions with 19 ward nurses, to discuss how the patients and families could be involved in the medication process (see Table 4-3). The participants in the focus groups agreed that there was a lack of medication knowledge among families. For instance, families reported not knowing some medications, and how to administer and store them (e.g. carcinogenic medications). Nurses indicated that some of the reasons for the parents' lack of knowledge may be due to the lack of involvement of parents in the medication process.

What are staff perceptions of errors and what is and is not reported?

The result of the focus groups in Phase One showed that ward nurses had different views on reporting medication errors on the ward. Nurses considered medication errors as part of the day-to-day practice. Only serious medication errors would be reported in IIMS by nurses. Most nurses felt that the current reporting and feedback culture on the ward did not facilitate best practice, but rather only collected error data for the organisation's management. Therefore, there was a lack of faith in reporting the medication error as a strategy to facilitate medication safety. To explore the reporting culture on the ward further, ***Patricia*** and ***Emily*** created education scenarios to ask nurses what medication errors someone would report, and would not report? Seventeen nurses participated in

these scenarios prepared by ***Patricia*** and ***Emily***, giving their responses to these two questions. The nurses' responses showed that they wanted to receive more feedback about the reported medication errors (see Table 4-3).

Step Three in the journey - Developing and implementing the interventions



In Step Three, the nurses developed and implemented five interventions on their ward, based on the four research questions they were exploring.

The interventions were developed based on the results and engagement of the ward nurses in Steps One and Two. After collating the findings and the 'potential' interventions, each team consulted the nurses on the ward to ask for their thoughts and perceptions about the proposed changes being considered, prior to developing the implementation plan. The process of developing and implementing these interventions were conducted, analysed and led by the ART nurses with the support of the broader research team (see Table 4-3). The table gives a summary of the accomplishments of the nurses and how they took different research approaches to reach their answers and implement changes on their ward. My role was to enable and support the nurses with their research. The interventions are outlined in Table 4-3.

AR nurses	Question	Method used	Number of participating ward nurses (n = 36)	Findings	Interventions	Outcomes
Lorraine, Sarah	Why is the shift structured the way it is?	• Focus group • Stakeholder engagement • Journey map/timetable of a 12hr shift • Fitbit data	12 nurses - junior and senior (33%)	• Highest medication errors occurred at the beginning of the night shift • Medication room is too small	• Changed administration time from 8 pm to 6 pm • Implementing medication trollies	The administration time has been maintained 4 medication administration trollies were placed in action
Venus	What are the nurses' understanding of the medication policy?	• Staff survey around the use of the policy	27 nurses (75%)	• Medication policy is outdated, not applicable and needed a major review	• Participating in updating the organisation medication policy and guidelines	The medication policy has been changed and updated
Lorraine, Sandra	How are we engaging families in medication administration?	• Focus group starting with a PowerPoint presentation	7 nurses (19%)	• Families lack medication knowledge on admission	• Admissions form: Adding additional question regarding parental involvement in medication administration	Families to have more involvement in the medication process
Patricia, Emily	What are staff perceptions of errors and what is and is not reported?	• Education scenarios of errors and asked what you would report and wouldn't report?	17 nurses (47.2%)	• Nurses request more feedback about their medication practice and medication errors	• Implementing safety, quality and care meetings	Sustained monthly Safety and Quality meetings

Table 4-3 Overview of AR nurses' interventions

Why is the shift structured the way it is?

- *Changed administration time from 8 pm to 6 pm.*
- *Implementing medication trollies.*

Lorraine and ***Sarah***, in consultation with the nurses on the ward, suggested to move the BD, or twice per day, medication administration time from 8pm to 6pm, to give the nurses more time to administer the medications and finish other duties before the night shift starts.

Lorraine and ***Sarah*** also found that the small medication room was an ongoing issue for the nurses and impacting on their workload and work flow. The small medication room had always been crowded, with many nurses in a small space trying to prepare and double check medications at the same time. To create more physical space for medication preparation, the ward nurses suggested using a medication administration trolley and to keep the medication room as a medication storage room only. This suggestion was supported and sponsored by the research team and the NUM, who purchased four medication trollies. The trollies were used to prepare and administer the medication at the patient's bedside. The existing medication room was then designated to store the medications and related supplies, such as syringes and medication cups. The implementation of the trollies was led by Lorraine and Sarah, and they had good staff engagement in the new practice.

By moving the BD administration time two hours earlier and implementing the medication trollies, nurses believed that they would be able to perform their medication process more thoughtfully, be more compliant with medication policy, as they would not need to rush things before the end of their shifts, and they would also have enough time for preparation and double-checking, as two nurses would be with the administration trolley. In addition, by preparing medication at the bedside, they had the opportunity to engage parents in the medication process (see Table 4-3).

What are the nurses' understanding of the medication policy?

- *Participating in updating the organisation medication policy and guidelines.*

Venus took the initiative to contact the hospital policy committee and request to be officially involved in revising the policy. ***Venus*** was able to show the survey results to the committee, including that the policy had impractical steps, was not evidence-based, that the policy was too large a document, and that engaging families in the medication process was not identified clearly in the policy. Consequently, ***Venus*** and the committee reviewed and updated the whole policy. The policy revision resulted in 1) the addition of new sections and instructions to place more emphasis on engaging families and patients in the medication process, 2) the removal of Step One from the policy (give one medication for one patient at one time), as this was, in fact, an error in the translation of the state medication guideline into the organisation's policy, and it was actually meant to say medication administration to one patient at a time, 3) the division of the policy to make it more compact and to separate preparation and administration from other elements, such as prescribing and storage of medications, and 4) the production of an online interactive version of the policy on the organisation's intranet, so nurses can source the information quickly and easily (see Table 4-3).

How are we engaging families in medication administration?

- *Admissions form: Adding additional questions regarding parental involvement in medication administration*

Lorraine and ***Sandra***, along with the ward nurses, decided to add additional questions to the Organisation Admission Form, regarding parental involvement in the medication process, to remind the nurses and doctors to ask the families about their medication information on admission. The questions added were about the current medication time and routine, the knowledge of parents about medications, and if they need education or any kind of support about the medications (see Table 4-3). The aim of this step was to give families and patients a chance to ask questions and to express their education needs, in terms of the medication process, and to voice any special routine they used for preparing and administering the medication to their child.

What are staff perceptions of errors and what is and is not reported?

Patricia and ***Emily*** created Safety and Quality (S&Q) meetings, to discuss incident reports, their causes, and how they could be prevented. Patricia and Emily were given access to the ward's IIMS data and they prepared de-identified summaries of the data for discussion at the meetings. The meetings were managed and run by ***Patricia*** and ***Emily*** without any intervention from the NUM or the clinical educators. The meetings were continuously conducted on a monthly basis. The goal of these meetings was to provide nurses with feedback about medication incidents and any other safety incidents on the ward that they wished to raise. This gave the nurses an opportunity to identify the safety issues on the ward and work collaboratively toward resolving the issues, by openly discussing, learning from, and developing solutions, from what they had discussed (see Table 4-3).

In summary, it is clear from the meeting minutes that the ART nurses' perceptions of research had changed over time. Initially, they reported that they had a fear and a lack of confidence, due to their lack of research experience and skills. However, these feelings motivated them to learn the research skills they needed for this project. Another motivator for nurses was the data from Phase One, which made them more conscious about the importance of changing their practice. These motivators and the research skills they learned enabled the nurses to have the initiative and strength to identify the questions that related to the medication practice issues on their ward, then lead the research and develop interventions to improve medication practice safety.

Nurse's engagement in research

Five key themes emerged from the semi-structured interviews with the ART nurses, 1) motivations for joining the research, 2) feelings of nurses before joining the research, 3) being part of the research team, 4) influence of research on their own practice, and 5) outcomes of research on nurses. Direct quotes from the interviews are used to highlight the findings. Pseudonyms were used for the quotes.

Motivations for joining research

The motivations for ART nurses to join the research are classified into two aspects, organisational and personal. The organisational motivators resulted from the awareness of some ART nurses that medication practice had some weaknesses and needed to be further developed. The nurses did not expect that the medication practice had so many issues or that their medication error rate was higher than the rest of the organisation. This was a motivating factor in encouraging them to join the project, because they realised a change was needed, as ***Emily*** noted, *"I do see a flaw in the practice",* while ***Patricia*** indicated that the best method to develop practice is research, *"I thought it's such a good opportunity especially focusing on our ward trying to improve practice"*. After they saw the results of Phase One, the nurses become aware that they need to work toward improving the medication practice urgently and that they wanted to be part of the changing process, as highlighted by ***Lorraine****, "Medication administration is something I felt could have been done better, so I wanted to be a part of helping that evolve and change to optimise patient safety, I guess. I think that is what kind of attracted me"*.

Other nurses joined the project because of personal interest. They saw the project as an opportunity to achieve their personal goals and indicated that joining the research team was an important step in their professional development and a good learning experience they could utilise in the future. "*Just to be involved and do something that's not just clinical and especially this early on in my career. I thought I'd learn a lot" explained* ***Sandra****.*

Despite the lack of experience of nurses in research, they were motivated to participate in this project because they have never had the opportunity to practice research, as discussed by ***Sarah***, *"Because I've never been involved in research, so I saw it as a challenge"* However, some were conscious that their lack of knowledge might be an obstacle for them, for example, ***Emily*** *explained, "I'm quite worried about participating that I can't provide anything to the team and the project"*.

Although the nurses described different reasons for joining the research project, they all agreed that it was a good opportunity to achieve a change, whether personal or professional. The nurses saw this research as a method of improvement and learning, despite the previous worries they had about research. In general, the nurses' motivation to join this research could be related to the fact that it was the first time they have been given an avenue to not only voice their perception about their own practice, but also the opportunity to take a leading role in practice change.

Feelings expressed by nurses about research

There was a consensus among the ART nurses when it came to their feelings about research. These feelings dated back to when they were at university and studied research as a mandatory curriculum subject. They found it dry and irrelevant to the reality of clinical practice, as indicated here by ***Lorraine***, "*It was difficult, I thought it was something scary, it wasn't exactly something that I particularly enjoyed".*

These negative thoughts had led to the nurses feeling disengaged while studying research as a subject at university, as ***Patricia*** highlighted, "*It just scares me because I hated that subject at university and I was like, I'm never going to use this, why do I need to learn? So, I didn't really listen too much".* Consequently, the nurses had negative perceptions about the effectiveness of research in clinical practice. For example, ***Sandra*** assumed that research was a long drawn out process that required *"a lot of paperwork"*, and, according to ***Lorraine***, has little impact on their clinical practice, *"I did not think research will improve practice much"***.**

When the nurses joined the research team, there was a sense of uncertainty, fear, and a lot of concerns related to the factors discussed above, and a number of other feelings, and this was also highlighted in their journey earlier. This included working with a group of researchers while they didn't have any research skills, as ***Patricia*** indicated *"You've got a lot of knowledge, you will be up there, and we will be down there".* They were also

concerned about how they would work with other nurses to implement changes on the ward, as ***Sarah*** highlighted, "*I was apprehensive as to how the staff would respond. Even before any changes were implemented, even before we talked about it."* Another concern was managing their time between clinical duties and the project commitments, as ***Emily*** indicated she already "*struggled with my time management so I wasn't sure how I would be able to make an additional responsibility work"***.**

These negative feelings were reported by the ART nurses prior to and shortly after joining the ART. The fact that these nurses were honest and open when speaking about these issues helped the broader ART to address these issues and engage the nurses more actively in the project, by supporting their development and encouraging them to be involved.

Being part of a research team

After a few months of participation in the ART, the ART nurses' negative feelings started to change to be more positive, and they began to change their ideas about research in general and specifically about this particular project. When the nurses both reported to the ART, during the meetings, about the work they had achieved between the meetings, they felt that their work was respected by other ART members. Their membership was valued and their participation imperative to reach the goals of the project, as ***Emily*** stated, *"The data that I've collected seems very important. That I've done a good job. So, in that way, I felt like a winning researcher".* The mutual respect between the ART members resulted in more collaborative work, which gave them a sense of belonging to the team, as ***Patricia*** expressed, *"You guys also respect our views… I like the team spirit".*

As the nurses felt that their participation in the project was valued and appreciated, their self-confidence increased. They also became more aware that they needed more time for their research activities and the importance of delegation if they needed assistance. ***Sarah***

explained, "*I became a bit more vocal about requiring help from the educators and getting them to cover me on the floor, so that I could work on our research"*.

The nurses recognised the importance of research in clinical practice as the best way to improve work culture, as ***Lorraine*** said, *"Research shows that things can be changed on the ward".* This led them to become more active in taking the lead to collect and analyse data and work with nurses on the ward during the period between ART meetings. "*I actually have done a little bit of researchy stuff there with other nurses in the ward"* said ***Venus.*** Finally, they became more motivated to work harder for the project, as they felt a sense of ownership for the project, as ***Emily*** said, *"Every time you told me the data that I've collected was very important to the project, I feel more motivated to do more because it is ours now"*.

It appears that as they felt that their voice was heard, that they were valued and well respected, their previous fears started to dissipate. Consequently, they had a sense of belonging within the research team and they started to feel that they were the drivers of the project.

Influence of research on their own practice

As the nurses started to feel more engaged in the ART, they began to think more positively about the research. They discovered the practical side of research and believed that their practice could be improved through research, as ***Sandra*** said, *"I have realised that research shows that things can be changed on the ward"*.

The main impact of engaging nurses in the project was the increasing awareness about their current medication practice. The nurses became more conscious about the nature of their practice and the importance and need for it to improve. They were also becoming more observant and able to distinguish different defects in the current practice, as ***Lorraine*** explained, *"Regarding working on the ward, now I realised, and I've picked up*

flaws in my own practice and I have been able to change the way that I think based on the research". They were sub-consciously and continuously thinking and observing their own and others' medication practice, as ***Sarah*** indicated, *"I notice more people don't know what drugs they are giving and why they are giving it. I'm also noticing more how staff are teaching students to give medications a lot more than I was before. So, my awareness is more in tune to what's going on"*.

The nurses were able to identify the supportive resources and methods that are already available on the ward, such as hospital policies, double-checking, five rights method, and the importance of utilising these resources to improve the medication process. They become more compliant with the hospital practice standards and believed that, as safety measures, they needed to be followed more strictly, as ***Venus*** stated, *"It definitely made me think more about the five checks"*. ***Emily*** also indicated, "I *am more aware of the importance of double-checking going to the bedside, which wasn't done so well in the past*"**.**

The ART nurse's engagement in this project has increased their safety awareness not only about medication practice but also about other aspects of patient care safety. Thus, the nurses acted like safe guards on their own ward, to ensure safe practice was provided to the patients.

Outcomes of research on nurses

The nurses' awareness about the flaws in practice and the need to improve practice resulted in developing new personal qualities. Their participation in this research project provided them with higher self-esteem and self-belief that they are capable to change and improve any issues in their practice. "*I feel that I am more confident in my ability, which I wasn't before",* said ***Venus.***

The participation in a long-term research project (18 months) created awareness among nurses that research is a lengthy process and outcomes do not happen overnight. Thus, to cope with such a condition, the nurses needed to have strength and to be *"patient to achieve the target",* according to ***Lorraine***, because they believed that *"research doesn't just happen overnight, it's a long-term thing",* said ***Venus***. This feeling encouraged them to develop personal strategies to reach the goal of the research process.

They started to see the results of their work, as ***Emily*** highlighted, "*It is satisfaction, now it's like I've made a change"*. The nurses felt that they were more encouraged and motivated to undertake initiatives to improve their situations. Most importantly, after gaining confidence and experiencing the positive outcomes of research, the ART nurses expanded their goals and started to think about new ideas to improve other aspects of their current practice, besides the medication safety. *"Now, I've always got ideas going boom, boom, boom in my head"* said ***Sarah.***

The ART nurses reported many benefits from participating in the project. These results indicate that they were able to develop and implement the changes they believed would improve their own practice and enhance the medication process. The interventions were discussed with broader stakeholder groups and an implementation strategy was developed by the ART. The influence of these interventions on the ward nurses' practice culture will be explored in the next section.

Generally, the results of Phase Two of this research showed that nurses were able to develop and implement the changes they believed would improve their own practice and enhance the medication process. The interventions were discussed with staff on the ward (as outlined earlier), as well as with broader stakeholder groups, such as the Parent Advisory Committee, hospital executives, and the pharmacist, for their input. An implementation strategy was developed by the ART, and reviewed and endorsed by staff on the ward, prior to a stepped roll-out of the plan. The effectiveness of these combined interventions will be presented in the third phase.

4.4 Findings from AR Phase Three (post-intervention)

The aim of this phase was to evaluate the effectiveness of the implemented interventions, by comparing the results of this phase (post-intervention) with the results of same data from Phase One (pre-intervention). The methods, process and sequence for data mirrored Phase One. Observational data (n = 16 rounds), staff focus groups (n = 5), audits (n = 13), SAQ (n = 46), IIMS and semi-structured interviews with ward nurses (n = 8), were collected post-intervention.

The medication trollies (one of the ART nurses' interventions) were introduced on the ward in the months before the commencement of the Electronic Medication Record (EMR) – a digital version of a paper medication chart that contains a patient's medical record, including medication record and prescriptions. As part of the EMR project, the paper medication charts no longer exist in the organisation and every ward has moved to using portable computers for the new digital medication chart. While the medication trollies may have assisted staff in the transition to the EMR, the EMR may also have influenced their thinking around medication administration practice and may have directly, or indirectly, impacted not only the research process but also the results of the research. Although it must be noted that the EMR only came in after the interventions had occurred, and the research was in the final phase.

The results of the practice observations and staff focus groups were collated and combined, and are presented below. The results of the pre and post medication policy compliance audit, SAQ and IIMS are also reported below, and in addition, the results of the semi-structured interviews with nurses who were not involved in the ART.

Observation and focus group results

Full details of the current ward work activities and cultures are presented to set the scene. Direct quotes from focus groups (FG) and excerpts from observer notes (ON) are used to highlight the themes.

Observing the Scene

A summary of observational data results is presented to provide a general picture of the ward medication practice activities and dynamic.

Medication activities are undertaken throughout the day according to the ward's shift changes. The current morning medication peak time is again at 08:00 am, however the evening peak time has now been changed to 06:00 pm. Changing the peak medication administration time from 08:00 pm to 06:00 pm aimed to 1) reduce the number of medications omitted, and 2) enable RNs to focus their attention on medication rounds, rather than having conflicting priorities such as a change of shift.

It was noted during the observation period that the ward now had a lower level of noise, was less congested, and nurses were able to plan their shift at their assigned patients' rooms. The nurses appeared calmer, not running or rushing to go inside the medication room. Each team of two nurses were using an hourly time sheet to plan their day shortly after the handover. This could be due to the nurses no longer needing to crowd in the medication room at the same time. As a result, nurses had more physical space (medication trollies) to work on which has resulted in lower noise levels and a more relaxed atmosphere.

"*Each group of two nurses had their own medication trolley, timesheet and standing in front of their assigned patients, planning their shift activities*" ON1.

The new practice of having two nurses working together all the time may lead to increasing the nurse's compliance with medication policy, in terms of double-checking the whole medication process at the bedside. The nurses stock their trolley in the medication room, then prepare and administer the medication at the patient's bedside. The medication room is now closed at all times. In the first phase, the medication room door was left open, which led to an increased noise level and opportunity for disruptions.

Four Astris Life Care mobile medication administration trollies with computers (see Photo 4-1) are used by nurses on the ward. Each trolley has A) a computer with intranet access, B) four drawers to stock syringes, gauze, cotton, alcohol swabs, water for injections vials, normal saline vials, C) a sharp container and rubbish bin at the side of the trolley, and D) a small torch attached to the computer. Implementation of the medication trolley with a computer aimed to overcome identified environmental barriers, shifting the preparation and administration of medications from a small, congested medication room to a medication trolley positioned at the bedside. The trolley is exclusively for the preparation and administration of medications, and used for storage purposes.

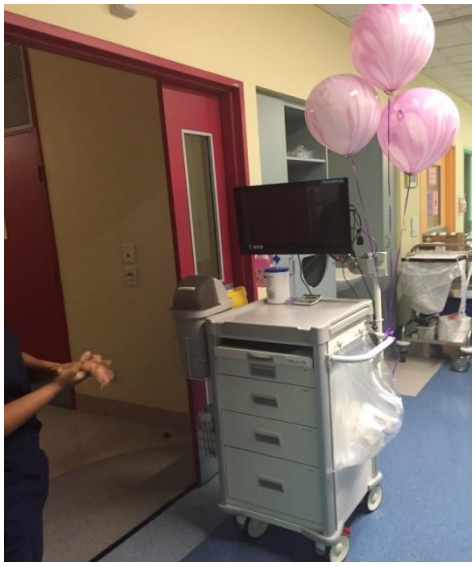


Photo 4-1Astris life care mobile medication administration trolley with computer

Having described the scene for medication practice on the ward, the collated results across the data sets (observations and focus groups) are now presented. Eighteen nurses attended five focus groups, representing 54% of ward nursing staff. Five dominant themes emerged from the combined data, 1) *getting the job done*, 2) *medication administration trollies*, 3) *visibility of nurses*, 4) *improved medication safety*, and 5) *parent involvement*.

Getting the job done

The updated medication practice on the ward created new tasks for nurses which generated a change from busy-ness in the medication room to busy-ness in the ward area. For instance, the medication trollies became like a new medication room for the nurses, where they perform the whole medication process on the trollies. So, the trollies need to be prepared and ready for the medication activities of the shift, *"Two nurses taking a medication trolley, one nurse adding syringes to the drawer of the trolley, another nurse is looking at the medication chart"* (ON2). Preparing the trollies for some nurses is time-consuming and sometimes nurses are seen to be running between the stores, to collect supplies, and the patient's room, which may cause a delay in the medication administration.

"You've got your medication box, but "oh it's not there", okay the syringe is not here, okay this thing is not here, so go back to the store room to get that stuff, ...can't leave the medication anywhere…so it just gets delayed and delayed" (FG3, N3).

The fact that nurses kept moving between the medication storage room (formerly known as the medication room) and the patient's room added more time pressure on nurses. In order to meet the deadline of their work, some nurses stated that they were taking shortcuts to be able to administer the medication at the right time, *"It is not easy, there is always so much to be done and so little time…I feel that we are expected to do more than one thing at a time, I know I cut corners otherwise it is just impossible to give the meds on time"* (FG2, N2). However, some nurses had figured out that they need to plan their shift carefully, as opposed to taking the shortcuts, *"I'll stock up everything now, and then I will start"* (FG4, N3).

Another factor assisting the nurses to get their work done is the change in access to resources. Previously, access to resources, such as MIMS (Monthly Index of Medical Specialities), calculator and computers, "*was a nightmare"* (FG2, N5) for nurses as they used to *"fight over 1 book"* (FG 2, N4). Now the resources are readily available making the medication process easier, as this nurse indicates, *"all the resources are there"* (FG3,

N3) and this in turn saves them time and reduces the frustrations with lack of access to scarce resources.

Despite the new type of busy-ness that resulted from preparing the trollies for the medication activities, the nurses' awareness about the importance of planning the daily activity and their ability to develop strategies to manage their time was highlighted, as they prepared and stocked the trollies at the beginning of the shift. While nurses in Phase One of this project were taking shortcuts to perform their tasks on time, in Phase Two, they were seen to overcome the new busy-ness scenario, by planning their shifts and using the available resources to make it more efficient. The process of undertaking medication at the bedside with two nurses had an influence on double-checking the medication. Nurses were no longer needing to spend time looking for the second checker, as they had previously, where they were often waiting around for each other to carry out all aspects of the medication administration process and thereby delaying the medication process.

Medication administration trollies

Implementing the medication administration trollies on the ward was a major change to the medication practice and work culture, and took the largest part of the nurses' discussion during the focus group sessions. The nurses were divided between those who were for and against the use of the trollies. Some nurses mentioned a few issues and disadvantages of using the trollies. For example, the trollies need ongoing maintenance, such as keeping the computers plugged in at the power point and maintaining the stock of syringes, needles, alcohol wipes and many other things, and for some nurses this represented a major issue, "*Stock management is an issue"* (FG3, N3), and *"None of us plug them in…. if you can actually find a trolley with a computer that works"* (FG1, N4). This caused frustrations among some nurses and added to their workload.

Occupational health and safety was another concern expressed by the nurses, particularly infection control, *"I think it looks grubby. You make the antibiotics and it sprays on the*

trolley, it gets sticky, it doesn't look clean" (FG1, N3). Trollies needed to be cleaned on a regular basis to avoid any hazard. The size of the trollies might also affect patient and nurse safety, *"trollies are so big"* (FG2, N3). Nurses were concerned about the potential for physical injury, as a result of manoeuvring problems while inside the patient room, *"Difficult to move into a four bedded room"* (FG1, N2).

However, despite these disadvantages, nurses believed that shifting the preparation from the medication room to the medication administration trollies had given them a more physically free space and a less chaotic environment. This resulted in a stress-free medication process, as this nurse indicates when recalling previous practice, *"Yeah, it's definitely been a lot easier to give morning medications and evening medications, like there are six people trying to crowd around the bench space that we had in the med room"* (FG2, N3).

The nurses also believed that the implementation of the medication administration trollies had created a safer medication practice, because of the easy access to the information about the medication and to the patient. Having a computer on the trollies provided constant available access for nurses to use the calculator and computer to obtain any information about the medication, *"it's safer now and because every computer has got the calculator…you're not like rummaging for a computer and so you can do your calculations"* (FG4, N2). The easy access to patient information meant checking the right patient and right medication occurred more frequently, *"you know the medication trolley in front of the patient, you're easy to check with an RN loudly and can say the name and date of birth, and it's easy for us to check with parents"* (FG3, N3).

The easy and constant access to information from the computers on the trollies has not only resulted in perceived safer medication practice (e.g. increased double-checking, ensuring the patient identity is checked) but also contributed to an effective and timely medication administration (influencing error rates). This was achieved by reducing interruptions that may previously have occurred while the nurses were searching for

information from other materials, such as a hardcopy medication book, or indeed when they were all trying to prepare medications in a cramped and noisy medication room, or when they were seeking out other nurses to assist in the medication process. This in turn may lead to a reduction in short cuts.

Visibility of nurses

The implemented interventions increased the visibility of nurses and made them more accessible for families and doctors, compared to the previous administration process, *"Two nurses inside the patient room preparing medication, the mum asking them about the medication"* (ON3). As nurses were preparing the medication outside of the medication room, it made them more visible to the families and gave a new opportunity and more time for families to ask the nurses about the medication process. The nurses believed that this interaction resulted in more family engagement in the medication process, *"Parents have more time to ask us more than ever before…they always ask about their child's medication"* (FG3, N1).

However, there was some variation in nurses' perceptions of being visible and more physically available on the ward. While some nurses perceive communication with families as "positive interaction", others believe that their medication process is being interrupted by families, *"being at the beside doing the medication checks, doing medication preparation and then being visible by parents asking lots of questions…I find it hard and disruptive"* (FG5, N1). These nurses perceive the interaction with families distracts them from their traditional tasks, such as the way they undertake medication administration. This distraction delays the nurses shift plan and results, at times, in nurses running behind schedule.

Another source of interruption considered by nurses was interruption by doctors. Medical rounds take place at a similar time each morning (during the peak morning drug administration time). Being more visible to doctors while using the medication

administration trollies may cause distraction for the nurses. Nurses stated that doctors are task-oriented, and they interrupt nurses regardless of being told not to do so, *"some doctor would say 'oh excuse me, can you just do this'... my answer will be like can you just go away for a minute. And they don't like when you say, 'just hold on a minute, I just need to do this first' and then they get all angry at you"* (FG4, N4). However, the awareness of the importance of reducing the interruptions of medication practice led the nurses to take the initiative, stating that *"sometimes you have to say to doctors 'look I'm just doing this, I am going to do these medications and then I'll come in and we can go through whatever'"* (FG5, N3). The new behaviour of nurses in stopping the doctors from interrupting them during the medication process indicates that the nurses have increased their awareness of the importance of creating a safer practice, by minimising any external factors that might affect their focus on the medication process.

Improved medication safety

There was consensus among the nurses that the new medication practice was safer than the pre-intervention phase, for many reasons. Firstly, because nurses were divided into teams of two, with each team using a medication trolley for preparing and administering the medication inside the patient's room, a second nurse was always available to check the whole medication process. *"Really around double-checking and stuff like that and a proper double check is a double check while the medications being made up against the order and then a double check at the patient bedside...and that has improved, by having a medication trolley, that you're doing the medications at the bedside"* (FG5, N3). The family/carer is also watching and listening to the nurses during this process, which makes them a third checker of aspects of the medication process. One nurse indicating they can *"Just clarify with the parents"* (FG2, N1), giving them the opportunity to include the parents in the medication process.

Having a second person available for checking the drug has also influenced the team spirit of nurses as they feel supported, *"having that second person means they don't have to go looking for someone"* (FG5, N3). This was described as a learning culture by a junior nurse, positively influencing their practice safety, as this nurse recalls *"one of my biggest*

fears becoming a new grad and one of the things I asked, when we started, "what do you do with the medication stuff", because I remember that as a student, no one would double check, no one would do things properly and being so scared to start and no one wanting to comply" (FG5, N1).

As this nurse indicated, the availability of having that second person as part of the process is, in itself, a safety mechanism and will result in new staff, especially new graduates, feeling more supported in the medication process.

The implemented interventions, such as the medication trolley, increased the safety awareness among nurses and made it easier for staff to be compliant with the medication policy, especially in relation to two nurses checking the medication at the bedside. Therefore, this is hopefully providing better care for patients, as well as ensuring nurses are complying with the correct practice, and feeling supported to do so.

Nurses also indicated that medication errors could be reduced with the new practice, as they spent more time at the bedside than before, so they double check the whole medication process, *"Chances of medication errors are less because we're at the bedside"* (FG3, N4). Despite the fact that some nurses consider the long interaction with families as a source of interruption, they are still more conscious of using and considering the families as safety resources.

While nurses still consider medication errors as part of day-to-day practice, these errors can now be more readily avoided and, if occurring, more easily managed. Nurses demonstrated a more positive perception about reducing errors after attending the S&Q meetings. They believe that these meetings are giving them a place where they can discuss medication errors with "no blame". They now believe that if they are reporting the error they can learn from the error, and discuss issues and responses with other nurses, "*Good*

things come out of the Safety and Quality meetings that we may make mistakes but if we can learn from each other, things will get better" (FG5, N3).

The nurses' perception of medication safety changed and resulted in increased double-checking. Nurses began to consider medication error as a learning opportunity, resulting in increased reporting when errors do occur. This new reporting culture gives a clear and more valid picture of medication practice and the actual medication errors happening on the ward. This might explain the IIMS results (post-intervention) where the total reported medication error increased between 2015 and 2016 (see later in this chapter for details).

Parent involvement

"*Two nurses with medication trolley inside the medication room, one nurse is checking the computer and the other one is explaining to the mum about the medication"* (ON1). Preparing and administering medication inside the patient's room makes the nurses directly visible to the carers and patients. As parents can see and check what nurses are doing in regard to the medication, they will naturally be more involved in the medication process, which will hopefully increase their confidence in the nurses' practice, *"it involves parents more, and they see us drawing it up and probably gives them more reassurances, seeing them being double checked"* (FG2, N1).

Nurses believe that providing families/carers with information and education about patient care is an important part of their daily practice, thus education of families is happening more frequently and consistently while the nurses are administering the medication, *"It's easier for doing medication education with the families because we do it at the bedside more, so they're more familiar with the process"* (FG3, N5). This new practice allows nurses to develop their personal skills, by doing multiple things during the one patient care episode, such as administering medication, educating parents and checking on the patients, *"Now we're doing many different things at the bedside"* (FG4, N3).

Consequently, if families are not sure about a medication, they have more time to ask the nurses about the medication process and different aspects of patient care, *"because families get more opportunity to see what we're doing and they question 'Oh are you doing it that way' ...like they get more understanding and more insight"* (FG3, N5). This positive relationship between nurses and patients and their families has produced mutual benefits for both sides. The medication education at the bedside makes the parents or the older children more independent to administer their own medication, *"when you've got older kids there as well, and you can involve them a bit more as well…So it gives them a little bit of autonomy"* (FG4, N2).

At the same time, nurses now consider parent knowledge and skills in medication management for their children, and are seen as an additional education resource. Nurses stated that families who have a child with chronic diseases become experts in their medications, so that they can act as supporters by providing junior nurses with knowledge and experience, *"The family seem able to be more involved and supporting junior staff"* (FG5, N3). This result is consistent with the results of the medication audit, which shows the increased family engagement in the medication process (see next section in this chapter for further details).

Involving parents in the medication process does not only improve the medication process itself, but also builds a trusting relationship between the nurses, families and the patients, which can result in a safer medication process.

Medication Audit (n = 13)

Table 4-4 compares the results of the medication policy audit between pre- and post-interventions, showing the percentage of the nurse's compliance with each step.

The 13 audits in the post-intervention phase consisted of 13 pairs of nurses having their practice observed; the sampling technique was to follow different nurses each time. This resulted in 26 nurses being observed as part of the audit. If the step was not observed in the post-intervention phase, it was labelled as Not Applicable (NA) in the table. The percentages of NA steps were not provided in the presentation of the final results, to ensure ease of comparison between the pre and post data. For instance, Step 14 result is showing 0% (NA) in 2016, this means that no IV medication was observed when I was collecting the audit data (it is does not mean that the nurses were non-compliant with this step). The table is only showing the steps that were achieved by the nurses (Yes%).

The only step where there wasn't an improvement post-intervention was Step One. The nurses were non-compliant with this step because they stated that it is not practical and non-applicable in real practice life. This step is now omitted in the new policy as a result of the implemented interventions in Phase Two. Other points that showed a reduction between 2015 and 2016 were because the step was "NA" in 2016 (see Table 4-4).

The medication round audit post-intervention demonstrated increased adherence to the hospital medication policy and procedures. Several improved practices post-intervention were observed (Table 4-4), in particular, the nurses were more compliant with 16 steps (out of 22) in the post-intervention phase than in the pre-intervention phase. The steps that did not show improvements post-intervention were either NA, or not observed during the audit in 2016. The audit results post-intervention showed that 100% compliance was achieved in eight of the 22 steps in the medication policy, compared to only five steps in the pre-intervention audit. The possible reason for the increase in the nurse's compliance with the hospital policy is due to the nurses' awareness of the importance of following

the policy, as a result of the research feedback and, in particular, the S&Q meetings where the policy is discussed with staff. Consistent with observation data and focus group sessions from Phase Three, the increased compliance can be seen in double-checking (steps 3, 16 and 22), adhering to the rights of medication (steps 5-12) and communication with families and patients (steps 4 and 15).

	Medication policy and guidelines - 22 checking steps	2015 n = 13 (Yes %)	2016 n = 13 (Yes %)
1	Prepare and administer one medication for one patient at any one time.	15%	0%
2	The same nurse must prepare record and administer the medication ordered.	92%	100%
3	Two nurses must independently check the medication process for all IV, IMI, SC and oral medication.	46%	81%
4	Wherever possible administer medication at the same/similar time and in a similar manner to how the parent/carer does at home.	77%	100%
5	Written and clear order (Right medication)-if unclear, do not give.	100%	100%
6	Right medication.	100%	100%
7	Right chart.	100%	100%
8	Right patient (Identification band), right weight and/or ideal body weight if the patient is overweight.	38%	100%
9	Right dose. Where required the dose should be calculated by 2 independent personnel. If not sure refer to the available resources such as MIMS, CHW drug handbook.	69%	73%
10	Right time and date.	92%	100%
11	Special precaution (allergies and confirm with the parents), confirm both brand and generic names, check dilution and administration rate for IV medication and DOUBLE CHECK pump settings.	23%	73%
12	Right route (the route is prescribed in the medication chart), the oral medication that require a syringe to deliver the medication MUST be in an oral syringe. IV access must be checked prior to administering the IV medication.	100%	100%
13	Does the medication require double check? (If unsure check with team leader or look it up) (IV, IMI, SC, oral and rectal & vaginal drugs).	100%	81% (NA)
14	For IV medication, the medication is to be taken to the patient in an individual tray, by both administering and checking nurse.	23%	0% (NA)
15	Explain clearly what is happening to the child and/or their carer.	1%	63%
16	The two nurses must witness the administration of the medication and sign the medication chart upon completion of the administration.	31%	81%
17	Ensure privacy and comfort of the patient.	76%	90%
18	All additive solutions prepared must be accurately and adequately labelled.	15%	27%
19	The equipment taken to the bedside are taken away at the end of the procedure and discarded appropriately.	85%	90%
20	If the IV medication is administered over a period of time, the maintenance of the infusion may be carried out by more than one nurse with adequate handover.	15%	0% (NA)
21	Withheld or missed doses are to be documented on the medication chart using the code on the medication chart.	0%	1%)
22	The two nurses must witness sign the medication chart upon completion of the administration.	23%	81%

Table 4-4 A comparison of 2015 and 2016 audit results of 22 steps of medication administration

Nurses' compliance with the five rights of medication significantly improved post-intervention. A compliance rate of 100% was achieved in four steps (right patient, right medication, right time and right route) during the post-intervention phase, while in the pre-intervention phase 100% compliance was only achieved in two steps of the five rights (right medication and right route). Though the 'right dose' check did not achieve 100% post-intervention, it increased from 69% pre-intervention to 73% post-intervention. The post audit identified that checking allergies of the patients (Step 11) improved in the post-intervention phase compared to the pre-intervention phase (73% post compared to 23% pre). The increase in the compliance of the five rights of medication and checking of allergies reflects the nurses' increased awareness of the safety culture and the importance the policy plays in ensuring patient safety.

It was also noted that nurses were working in teams of two more often in the post-intervention phase than the pre-intervention phase, as can be seen from Step 3 (46% to 81%) and Step 16 (31% to 81%) (see Table 4-4). The improved compliance with the rights of medication and the increased double-checking could be due to the medication administration trollies and the availability of a second nurse to check the process, which created a more positive teamwork climate on the ward (see later for details of SAQ results).

Improved communication between staff and patient and parent/carer was noted in the audit results post-intervention. This is shown in improvements in Step 15 of the audit, "Explain clearly what is happening to the child and/or their carer", where the compliance rate was 1% pre-intervention, compared to 63% post-intervention. This may have been as a direct result of the medications being prepared and administered at the bedside. Additionally, it is clear that nurses are communicating more with families and patients, as shown in improved outcomes in Step 4 of the audit, with nurses administering medication in a similar manner to how the parent/carer does at home (77% pre to 100% post). This indicates more family involvement in patient care. This could be as a result of the increased visibility of nurses, due to using the medication administration trollies,

giving greater emphasis on including the family and more time for families to be engaged in the medication process.

Incident Information Management System

The IIMS data from 2014-2016 for the ward showed a reduction in medication administration errors. While in the pre-intervention phase, the medication administration error rate was 77%, the administration error rate post-intervention was reduced to 71%. The prescribing problems remained at 21% of medication error types for the ward (see Figure 4-5).

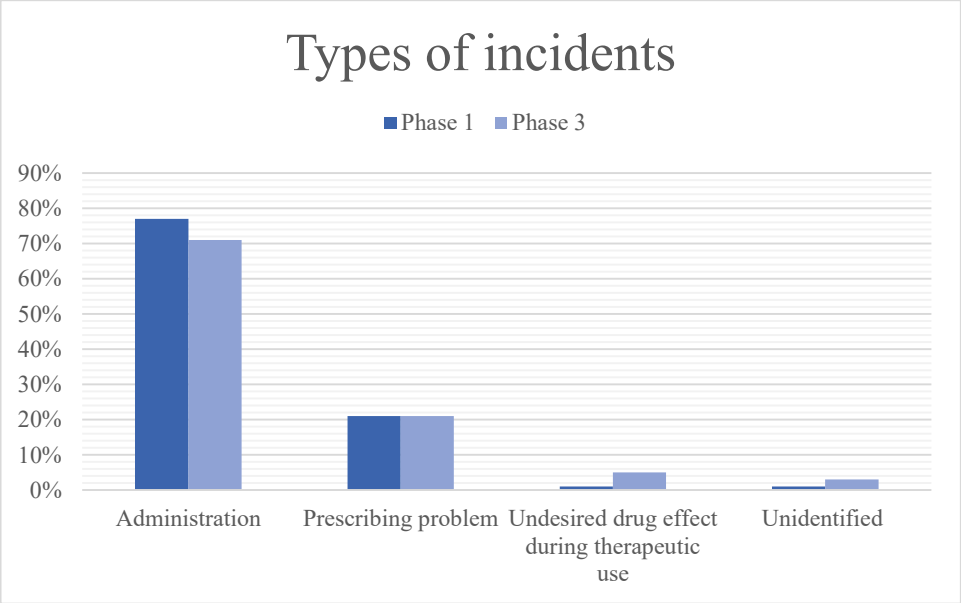


Figure 4-5 Comparison of medication incident types (pre- and post-intervention)

Even with the reduction in the omission of medications between 2014 (n = 9, 25%) and 2016 (n = 3, 16%), omission errors remain the most commonly reported error (Figure 4-6). The omission of medication is predominantly attributed to prescribing error, poor documentation following ward transfer, and transition from an alternate administration mode. The incorrect medication administration route and incorrect dose account for the other most commonly reported and classified errors (Figure 4-6). A number of medication administration error types that were reported pre-intervention (2014) were not reported in post-intervention (2016), specifically wrong frequency, wrong order administered,

delayed dose, and wrong medication. These results reflect improvements in the medication practice, which may be due to the implemented interventions on the ward and, possibly, the introduction of the EMR may have also influenced this.

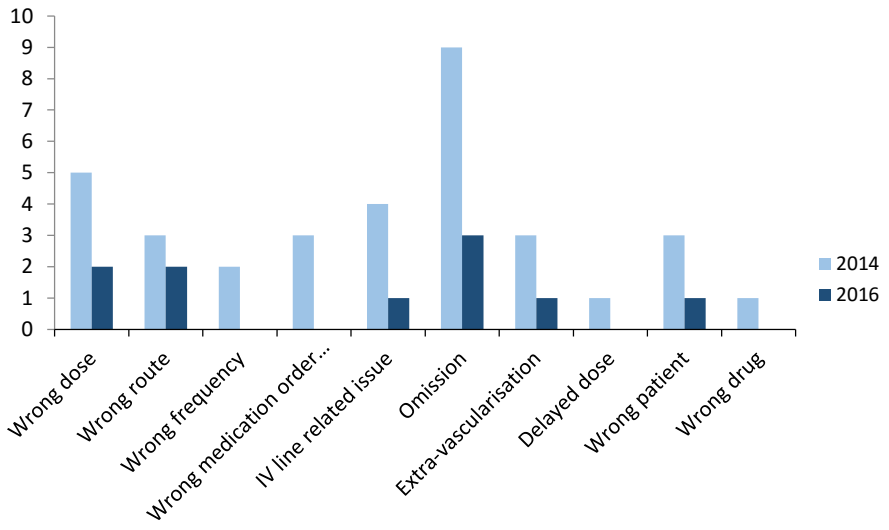


Figure 4-6 Classifications of medication administration errors by year

In comparison to the pre-intervention phase, where the highest medication error rate occurred between 08:00 am and 10:00 am and 08:00 pm and 09:00 pm, the highest medication error rate in the post-intervention phase occurred between 07:00 am and 08:00 am (11.1%) (see Figure 4-7). The reduction of medication error rate in the evening time could be due to changing the shift structure, as suggested by the nurses, and moving the administration time two hours earlier in the evening (from 8 pm to 6 pm).

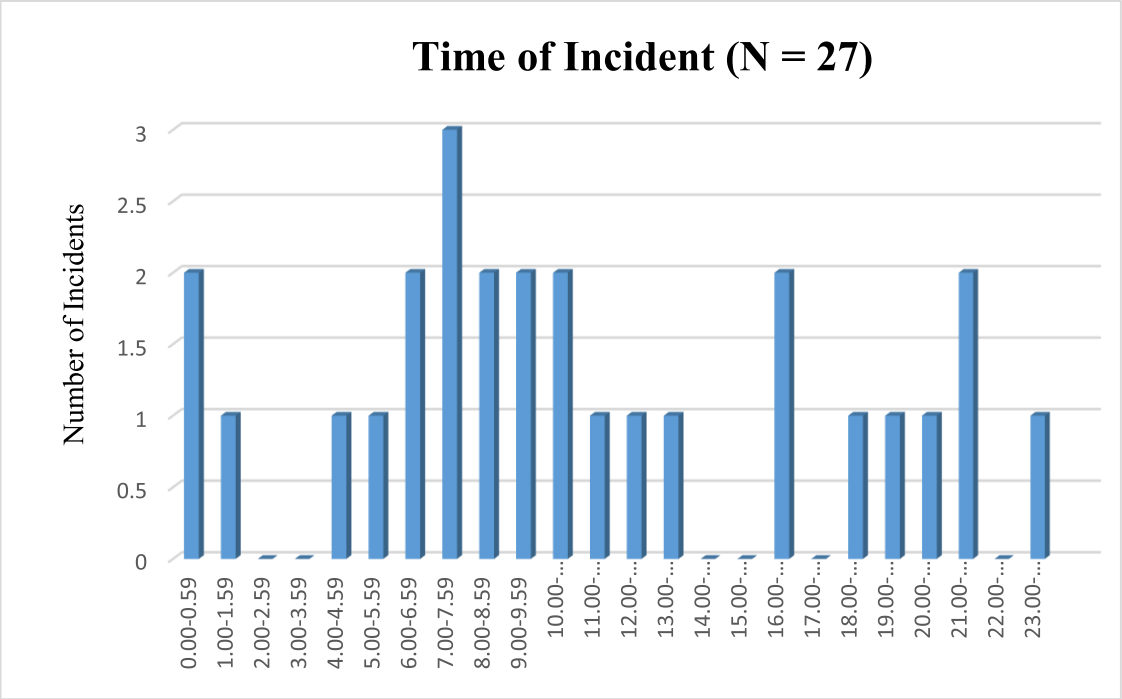


Figure 4-7 Time of incidents post-intervention

In the post-intervention phase, the results of the IIMS data is presented in two formats; medication error rate per 1,000 admissions and error rate per 1,000 prescribed medications. The rate of reported medication errors and the rate of medication administration errors, per 1,000 patients admitted to the participating ward, steadily declined between 2014 and 2016, despite the increase in the number of admitted patients each year (Table 4-5). The overall medication errors on the ward declined by more than 45%. The most significant improvement found between 2014 and 2016 is in the rate of medication administration error (per 1,000 patient admissions), where the rate dropped by more than 56%.

	2014	2015	2016	Changes (2014-16)
Number of patient admissions	867	907	1018	⬆ 14.8%
Rate of total medication errors per **1,000 patient admissions**	48.4	39.6	26.5	⬇ 45.2%
Medication administration errors per **1,000 patient admissions**	41.5	27.5	17.9	⬇ 56.8%

Table 4-5 Medication error rate per 1,000 patient admissions

The number of prescribed medications increased from 26,960 at the commencement of this research in 2014, to 33,510 in 2016, although there was a rapid increase to 48,629 in 2015. This could be explained by the increase in number of patients between 2014 and 2016 requiring multiple medications in their care regime (from 867 to 1018 admissions), as shown in Table 4-5. Despite the increase in number of prescribed medications between 2014 and 2016, the medication error rate declined. The highest reduction occurred between 2014 and 2015, with a drop of more than 50%. The rate of medication errors per 1,000 prescribed medications declined from 2014 to 2015, prior to a slight increase from 0.7 in 2015 to 0.8 in 2016 per 1,000 prescribed medications (Table 4-6). However, while the total number of errors increased, the rate of medication administration error plateaued to 0.5 per 1,000 prescribed medications in 2015 and 2016, which is a significant drop from the 1.3 reported in 2014. Therefore, medication administration errors were reduced since the commencement of the project, while the rate of overall errors (at any stage of the medication process) increased slightly between 2015 and 2016.

	2014	2015	2016
Prescribed medications for ward inpatients	26960	48629	33510
Rate of total medication errors per **1,000 prescribed medications**	1.5	0.7	0.8
Medication administration errors per **1,000 prescribed medications**	1.3	0.5	0.5

Table 4-6 Medication error rates per 1,000 prescribed medications

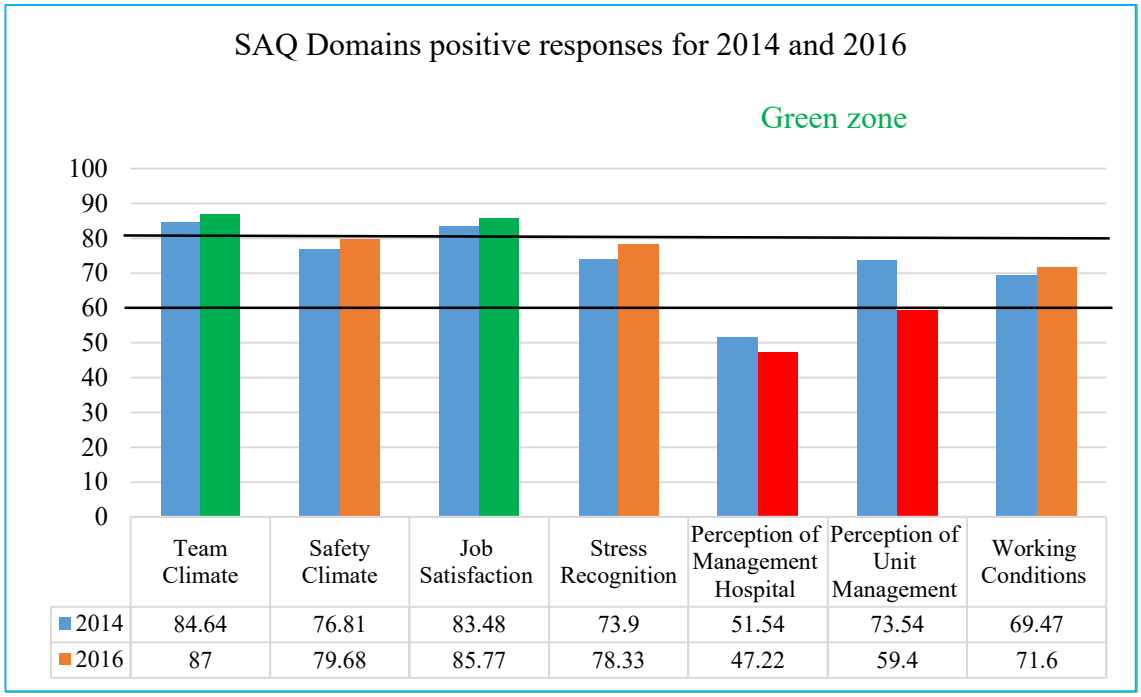
Safety Attitudes Questionnaire

A total of 45 completed surveys were returned in Phase Three with nurses representing 80% (n = 36) of the respondents. This number represents 100% of the nursing population on the ward, compared to only 70% of nurses completing the SAQ in the pre-intervention phase. This number may indicate the increased interest in medication safety, due to the project and research participation of nurses on the ward. The second highest response rate came from doctors (see Table 4-7). The vast majority of the respondents are female (n = 43), more than 95%.

Answer choices	Responses %	Numbers
Doctor	8.8%	4
Nurse Practitioner	0	0
Nurse Unit Manager	4.44%	2
Registered Nurse	75.56%	34
Enrolled Nurse	0	0
Assistant in Nursing	22.2%	1
Pharmacist	0	0
Therapist (PT, OT, Speech)	0	0
Dietitian	22.2%	1
Other	6.67%	3

Table 4-7 The demographic work profile of participants who completed the SAQ (Phase Three)

Figure 4-8 shows a comparison between 2014 and 2016 in SAQ results. The results of 2014 are in blue, while the results in 2016 are presented in a traffic light system of colours. The figure shows that positive responses across the SAQ domains ranged from 50.66% to 87% in 2016. Improvement was reported in five domains, safety climate, team climate, job satisfaction, stress recognition and working conditions. The stress recognition domain had the largest increase of 4.43% (from pre to post), while perception of unit managers recorded the largest decrease, dropping by 14.14%. Two domains showed a decrease since 2014, perception of hospital and unit management domains (↓4.32% and ↓14.14% respectively).



	Team Climate	Safety Climate	Job Satisfaction	Stress Recognition	Perception of Management Hospital	Perception of Unit Management	Working Conditions
2014	84.64	76.81	83.48	73.9	51.54	73.54	69.47
2016	87	79.68	85.77	78.33	47.22	59.4	71.6
	↑2.36	**↑2.87**	**↑2.29**	**↑4.43**	**↓4.32**	**↓14.14**	**↑2.17**

Figure 4-8 Percentage of positive responses in SAQ domains (2014 and 2016)

The comparison of SAQ individual responses between pre- and post-interventions are presented in Table 4-8. The implemented interventions likely supported the teamwork climate on the ward. Staff reported feeling more positive about their team spirit in the post-intervention phase, where the positive responses improved from 84.64% to 87%, and remained the highest scoring domain. It is worth noting that the improvement in this domain was noted in almost all the questions, except "The physicians and nurses here work together as a well-coordinated team" (90.90% to 86.66%), see Table 4.8. Despite this, the improvements in the other questions reflect an increase in staff confidence to speak up, discuss errors and ask for help. The highest scoring question post-intervention phase was "It is easy for personnel here to ask questions when there is something that they do not understand", scoring 95.56%. This may reflect the staff tendency to learn more and their confidence to ask questions if they lack information.

While still being in the amber zone, improvement was noted in safety climate (76.81% to 79.68%) (see Figure 4-8). This domain monitors the organisation commitment to safety.

Four out of seven questions reported improvement in the post-intervention phase. For example, one question "I am encouraged by my colleagues to report any patient safety concerns I may have" showed a noteworthy improvement in the post-intervention phase, increasing from 75.7% to 93.33% (see Table 4-8). This question reflects an improvement in nurses' awareness of the importance of reporting any incidents. The nurses in the post-intervention phase were more satisfied with the safety culture on the ward, this may be due to the fact that they are taking the initiative to observe the safety practice themselves, through the S&Q meetings. This result is consistent with the audit tool results, where nurses are more attentive to double check the five rights of medication and allergies of the patient in the post-intervention than the pre-intervention phase. However, three questions in this domain reported a decline in positive responses in the post-intervention phase, including "Medical errors are handled appropriately in this clinical area" (80%), "I know the proper channels to direct questions regarding patient safety in this clinical area" (88.89%), and "I receive appropriate feedback about my performance" (55.56%). The responses to these questions may indicate that the staff are still not satisfied with how errors are managed on their ward, and the lack of feedback about performance still exists.

Staff are more satisfied with their working conditions and workplace. This can be seen in the job satisfaction domain, after implementing the changes on the ward the positive responses have increased and remained in the green zone (83.48% to 85.77%) (see Figure 4-8). The improvements in the post-intervention phase are noted in all questions except one in this domain, which relates to morale, which has dropped from 64.2% to 62.22% (see Table 4-8). This result may also be linked to their perceptions of unit management, which is discussed later in the section.

The staff reported that they can handle work stressors in the post-intervention phase more successfully than they reported in the pre-intervention phase. This is evident in the stress recognition domain that changed from 73.9% pre-intervention to 78.33% post-intervention – although this is still in the amber zone it is moving closer to the green zone (see Figure 4-8). The improvement in positive responses in this domain were noted in three out of the four questions (see Table 4-8). This may reflect increased staff confidence

in their ability to cope with emergency situations and with work pressure, which are linked to increased availability of resources and access to information, such as medication trollies and computers.

The only two domains that reported a decline between the pre and post measures were perception of hospital management (51.54% to 47.22%) and perception of unit management (77.27% to 59.4%), as shown in Figure 4-8. In the perception of hospital management domain, four out of five questions showed a decline in the positive responses. In the ward management domain, the decline was found in all questions (see Table 4-8). The reduction of perceptions of the unit and hospital domains relates to the approval of managerial actions in the organisation. The results of these two domains reflect a worsening dissatisfaction with management at different levels (the ward and hospital management levels).

The working conditions domain reported an improvement in the post-intervention phase (from 69.47% to 71.60%), however the responses were still in the amber zone area (see Figure 4-8). The improvements were noted in all questions except one, "This hospital does a good job of training new personnel" (80% to 66.67%) (see Table 4-8). The staff reported they were more satisfied with the communication between multidisciplinary teams in the post-intervention phase, compared to pre-intervention, "All the necessary information for diagnostic and therapeutic decisions is routinely available to me" (75.55% compared to 70.2%) (see Table 4-8). The level of staffing also improved from 57.1% (red zone) to 64.44% (amber zone). This is consistent with the improvement in the teamwork climate and may contribute to the improvements in the job satisfaction domain.

Generally, the improvements were noted in the domains that the staff were able to influence after implementing the interventions. For instance, the improvements in the teamwork climate, safety climate, job satisfaction and working condition domains were mainly noted in the questions that related to teamwork and communication. The improvements in these domains reflect developments in horizontal relationships between

the staff themselves (see Table 4-8) rather than those with managers. The perception of unit and hospital management domains showed a worsening perception by staff of management in the post-intervention phase. The reduction in these two domains might reflect a worsening vertical relationship between staff and management.

Teamwork climate	2014	2016
Nurse input is well received in this clinical area	94.6	88.89
In this clinical area, it is difficult to speak up if I perceive a problem with patient care	80.6	82.22
Disagreements in this clinical area are resolved appropriately	60.5	77.78
I have the support I need from other personnel to care for patients	89.6	91.11
It is easy for personnel here to ask questions when there is something that they do not understand	91.6	95.56
The physicians and nurses here work together as a well-coordinated team	90.9	86.66
Average percentage	**84.64**	**87.0**
Safety climate		
I would feel safe being treated here as a patient	94.4	95.56
Medical errors are handled appropriately in this clinical area	84.3	80
I know the proper channels to direct questions regarding patient safety in this clinical area	94.6	88.89
I receive appropriate feedback about my performance	58.1	55.56
In this clinical area, it is difficult to discuss errors	63.8	73.34
I am encouraged by my colleagues to report any patient safety concerns I may have	75.7	93.33
The culture in this clinical area makes it easy to learn from the errors of others	66.6	71.11
Average percentage	**76.81**	**79.68**
Job satisfaction		
I like my job	89.9	93.34
Working here is like being part of a large family	81.1	84.44
This is a good place to work	91.7	93.33
I am proud to work in this clinical area	90.5	95.56
Morale in this clinical area is high	64.2	62.22
Average percentage	**83.48**	**85.77**
Stress recognition		
When my workload becomes excessive, my performance is impaired	75	86.67
I am less effective at work when fatigued	84.9	93.34
I am more likely to make errors in tense or hostile situations	78.4	75.55
Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure)	57.3	57.78
Average percentage	**73.9**	**78.33**
Perceptions of management (hospital)		
Hospital Management supports my daily efforts	53.2	40
Hospital Management doesn't knowingly compromise patient safety	53.1	43.88
Hospital Management is doing a good job	48.7	49.78
Problem personnel are dealt with constructively by our Management	50.4	31.23
I get adequate, timely info about events that might affect my work, from Management	52.3	42.22
Average percentage	**51.54**	**47.22**
Perceptions of management (unit)		
Unit Management supports my daily efforts	78.1	57.56
Unit Management doesn't knowingly compromise patient safety	77.5	62.23
Unit Management is doing a good job	76.2	62.22
Problem personnel are dealt with constructively by our Management	58.6	55.3
I get adequate, timely info about events that might affect my work, from Management	77.3	59.77
Average percentage	**77.27**	**59.4**
Working conditions		
This hospital does a good job of training new personnel	80	66.67
All the necessary information for diagnostic and therapeutic decisions is routinely available to me	70.2	75.55
Trainees in my discipline are adequately supervised	70.6	80
The levels of staffing in this clinical area are sufficient to handle the number of patients	57.1	64.44
Average percentage	**69.47**	**71.6**

Table 4-8 Comparisons of SAQ questions between 2014 and 2016.

Semi-structured interviews (ward nurses experience)

Eight semi-structured interviews with nurses (who were not engaged in the ART) were conducted (27% of nursing staff). The aim of these interviews was to explore the nurse's perceptions of the medication safety project interventions on the work culture and medication practice on their ward. The thematic analysis of these interviews resulted in three themes, 1) what it is all about? 2) the interventions' aftermath, and 3) changes in nurses' practice. Direct quotes from the interviews are used to highlight the findings. Pseudonyms were used for the quotes.

What it is all about?

It is likely that despite the long period of this research and the changes of practice in the targeted ward, the nurses who did not directly engage as part of the ART, did not always recognise all the aspects of the project. Knowledge about the aim and the interventions of the project varied across the nurses who were not directly involved in the research. Only a few nurses were aware of the general aim of the medication safety project, stating that the project purpose is to reduce medication error by seeking patients' and parents' participation in the medication process, as ***Trudie*** indicated, "*Well it's about trying to reduce the number of sort of incidents on the ward and making it safer, the way that we administer medications, involving the families more"*.

The aim of the project appeared to be ambiguous to other nurses, despite the changes that had been implemented. Some of the nurses were unable to recollect the changes associated with the project, as highlighted by ***Sabrina,*** "*I can't tell you much I know that it's been ongoing for a while but I'm not entirely sure what specific things have been done…. don't know any of the interventions"*. The possible reason for the ambiguity of the project's aim may have been the introduction of the EMR just after the interventions of the current study (Phase Two), when the changes in practice were taking place (e.g. the medication administration trolley was introduced a few months prior to the EMR commencing). Nurses believed that the introduction of the EMR project caused a misunderstanding between the two projects, as ***Sharon*** said, *"The EMR makes*

confusion". This confusion created vagueness for nurses, as they did not know the difference between the two projects and which interventions resulted from each of the projects. "*It's all about the trolleys and EMR as well" said* ***Lucy****.* The trollies were implemented as part of this ART research but were linked to the EMR, as the introduction of the EMR also required the use of the trollies for medication administration, even though the trollies themselves were introduced as part of the research a few months prior to the EMR.

Regarding the information about the interventions that had been implemented on the ward, medication trollies were predominantly the clearest intervention identified by the nurses. This may be because they had significantly changed nursing practice compared to the other interventions. The first thing nurses mentioned when they were asked about the project interventions was *"Medication trollies"* said ***Lucy***. "*I think the trolleys"* said ***Sue****.*

The nurses justified their lack of information about the project due to their lack of engagement in the development process of the interventions. The interviewed nurses indicated they had not been strongly engaged in the project activities, such as data collection, meetings and workshops, as ***Trudie*** said, "*But I haven't been involved in the project",* despite ongoing invitation from the AR nurses to do so *"They encouraged us to go to meetings and use trollies"* explained ***Sue***. The only form of engagement that was mentioned by the interviewed nurses was attending some information sessions earlier when the project started, *"I haven't just other than going to the meetings when they're on"* said ***Sharon***.

The nurses also stated a few reasons that may have prevented them from engaging in the project development. This included workload and the inconvenient time for nurses to participate in the project's different activities, as ***Eileen*** explained, *"Either it's been I haven't been rostered on, or it's been busy on the ward"* or they had not been approached by the ART nurses to be involved, *"Well I haven't been asked to be involved"* said ***Sharon***.

The introduction of the EMR and the inability of the interviewed nurses to participate in the project during different stages caused a lack of information and knowledge about the project aim. Most of the implemented interventions were unknown or vague to nurses, and they were only aware of the medication trollies as the clearest intervention.

Even though many nurses were involved in the data collection prior to the intervention implementation in Phase Two, some nurses still did not appear to have enough information about the project or did not recall the activities they were involved in earlier in the project. This could be explained by the fact that five of the eight interviewed nurses had been employed after the commencement date of the research, and thus did not experience the full research process and the development and implementation of the changes that occurred on the ward, and may not have had the opportunity to participate in the research activities.

The interventions' aftermath

The lack of information about the project's aims and interventions did not prevent the nurses experiencing positive improvements in clinical practice. While nurses were unsure about the difference between the medication safety project and the EMR, they felt that a constructive change in practice had occurred. The nurses had a positive view about the interventions and the changes in their medication practice. They realised that it is safer to give medications at the bedside, as ***Sabrina*** indicated, *"it possibly increases the safety",* and increased their awareness of medication errors, which led to paying more attention to their practice, *"I think they are good; I think they have helped people realise how easy it is to make an error"* said ***Ally***. Nurses also became more aware of the importance of being compliant with the policies and to use them as a tool to question any practice that is non-compliant. For example, ***Lucy*** explained, *"If they see you doing something that isn't in the policy, they will question you".* The medication safety project also created a sense of teamwork spirit on the ward, where everyone felt more supported than before, as indicated by ***Sue***, *"I feel more looked after by the team than before"*.

This healthy relationship was not only found between nurses, but also between nurses and families, as ***Sara*** said it had *"Improved a rapport probably between the parents if they were feeling more involved with the nurses"*. Involving parents in patient care (e.g. administering medication to their child) makes the relationship between families and nurses more collaborative and flexible, so that parents can ask questions, as ***Sue*** stated, *"families are asking us more about their child's antibiotic, TPN and cytotoxic medication"*. This new collaborative work culture resulted in more workflow and less workload, which then saved the nurses time. *"Things like if the child doesn't need medication, the parent will say something to us that they think that the child is comfortable so, you know we're not wasting time or drawing up a med that we do not need",* commented ***Eileen***. The efficiency in the new practice, reflected by the nurses, resulted in reduced work-related stress and increased the goal of nurses to get their work done on time.

Despite the consensus of the ward nurses about the positive effect of the implemented interventions on medication safety, some nurses believed that they needed more time to finish their work with the new interventions, as ***Sara*** explained, *"Drawing up meds by the bedside is time-consuming"*. The nurses were aware of the new challenges in practice and were already thinking how to improve them. For instance, to overcome the time issue ***Sabrina*** suggested new strategies need to be developed in order to meet their daily tasks, *"I guess with a little bit of planning we will be fine and finish our work before the shift finishes"*.

Nurses believed that the new changes had improved their practice in general and created a safer environment. The ward nurses became more adaptive to the new changes, by being more organised and taking more time in planning their shift activities. This is evident in the observation findings, where nurses are now starting their shifts by discussing the plan of their tasks before they start (see earlier in this chapter, observing the scene).

Changes in nurses' practice

Nurses learned that they needed to pay more attention to medication administration practice and to be more conscious about medication errors. One of the first things they learned from the project was to include families in the medication process and this has contributed to the medication error reduction, as ***Sara*** explained, "*I know now the importance of involving the parent".*

Nurses gained confidence and ability to discuss openly medication errors that might happen on the ward. They were no longer reluctant to report errors, as they could learn from reporting them. ***Eileen*** explained, *"I can say now that I learn from reporting medication errors"*. They recognised that the S&Q meetings had created a supportive culture to report medication errors without fear of being punished. This also indicates that nurses now trust the reporting culture on the ward more than what was indicated in Phase One, as ***Ally*** stated, *"I guess like just to be aware of the errors that can occur and the process to report them if they do and that it is not a shame and blaming sort of thing anymore".* This result is consistent with the result of the SAQ, where the safety climate domain score increased in the post-intervention phase and moved to the green zone. This reflects the staff commitment to safety and their willingness to report medication errors and any other medical incidents. This might explain the increase in the rate of medication incident reports between 2015 and 2016, as shown in the IIMS results in Phase Three, as this was related to errors at any stage of the medication process while administration errors stayed at 0.5 per 1,000 prescribed medications in the same time period (see Table 4-6, page 202).

Additionally, nurses appeared to appreciate and value research because they experienced positive outcomes after implementing the interventions. In spite of the fact that they did not actively participate in the research activities, the ward nurses reported seeing that research had a practical result. For instance, nurses recognised the importance of research in improving practice and finding solutions for any flaws in their practice culture, especially medication safety. As ***Sabrina*** explained, *"I think it's important like research to find better ways, better practices"*. Most of the nurses interviewed showed a

willingness and interest to be involved in research projects in the future, as they now could see that it is an effective way to improve nursing clinical practice. ***Lucy*** explained, *"Research is really important, and it obviously has a massive impact on what we do. Yeah, I like being involved in that kind of thing"*.

The positive experience of nurses with this research would promote the nurse's participation in future research projects, which may result in sustainability of a research culture on the ward.

4.5 Summary

This chapter presented the findings of the three phases of this study. In Phase One, the results showed that the participating ward had a higher medication error rate than the medication error rate across the organisation. The staff in the participating ward were unsatisfied with their working conditions, such as level of workload, busy-ness, small medication room and lack of resources. The nurses also had a negative perception about unit and hospital management. Furthermore, the impracticable steps in the medication policy led to a decrease in the compliance rate of nurses with the policy. Therefore, there was a need to work with nurses to develop interventions that were appropriate for a safety focused working culture, in order to reduce medication errors.

In Phase Two, despite initial negative feelings by ART nurses about research, they showed that they were able to identify weaknesses in their medication practice and then develop a bundle of interventions that were suitable for their working culture. The ART nurses implemented five interventions to improve medication practice and culture. These interventions were:

- changing BD administration time from 8 pm to 6 pm,
- implementing medication administration trollies,
- participating in updating the organisation's medication policy and guidelines,

- amending the Admissions form – adding an additional question regarding parental involvement in medication administration, and
- implementing safety, quality and care meetings monthly on the ward for nursing staff.

The ART nurses' participation in this research project changed their view about research, as they became more research oriented to the importance of research. Their participation in this research project provided nurses with a learning opportunity, improved their team spirit, made them more supportive of each other and more engaged with patients and families. Their self-confidence increased and their ability to report flaws in practice without fear also improved.

The implemented interventions reduced the reported medication errors significantly, as shown in Phase Three. Although the nurses in the participating ward recognised some negative consequences of the implemented interventions, they stated that the overall changes were positive, improving the safety of the medication process and providing benefits for the patients and their families.

The ward nurses, who were not directly engaged in the research, recognised that the overall changes were positive for the safety of the medication process and the patients. The nurses' satisfaction has also increased, especially teamwork climate and job satisfaction. Consequently, ward nurses are more interested now in learning about joining future research projects.

The next chapter will discuss in detail issues surrounding 1) engaging nurses in medication safety research, 2) partnering with consumers, 3) building research capacity, and 4) accountability of nurses after engagement in research. Issues about the ownership of the research will also be discussed in the next chapter.

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Chapter 5 Discussion

5.1 Introduction

This collaborative research aimed to develop, implement and evaluate targeted interventions for improving medication safety, by bringing nurses (and families) into an Action Research Team (ART) to improve medication safety. The research also aimed to understand how nurses would engage in research and lead a practice change in their work environment. An AR design was used in this research, as it enabled a participatory, democratic process (Titchen 2015) and engaged nurses in the ART over three phases. A mixed method approach was used to collect the data, to allow the combining of quantitative and qualitative data for corroboration and elaboration of the findings. The mixed method approach allows a multifaceted adaptation of a range of research methodologies to answer a research question (Johnson & Onwuegbuzie 2004).

The aims of this research were achieved. The results of Phase One showed that there were many barriers to safe medication practice on the ward, which included 1) lack of physical space and resources, 2) outdated and impractical medication policy that lead nurses to be non-compliant with the policy, 3) lack of consensus on what a medication error is and what should be reported, and 4) the nature of the shift structure that led to an increase in the busy-ness level and workload of nurses. The nurses were successfully engaged in the ART and, after analysing and reflecting on the results of Phase One, they developed and implemented five targeted interventions to improve medication safety on their ward, in Phase Two of the research. In the post-intervention phase (Phase Three), findings suggested that the number of medication administration errors were reduced by implementing a multidimensional approach, rather than a single intervention, achieving the primary aim of this study. This project also engaged nurses in the research process and findings demonstrated that clinical bedside nurses could undertake research without prior research experience, but they needed support and research training. The interventions were developed and implemented by the nurses and highlighted the importance of engaging parents/carers in the medication safety agenda at the bedside.

This chapter will discuss four important outcomes related to reducing medication errors that emerged from the results of this study:

1) engaging nurses in medication safety research,
2) partnering with consumers,
3) building research capacity, and
4) accountability of nurses after engagement in research.

These outcomes resulted in improving the safety culture on the ward. They also contributed to sustaining the results of the study, as nurses were more engaged in different initiatives and worked collaboratively with the NUM to improve their medication practice. To conclude the chapter, the strengths of the current research and recommendations for future research are outlined.

5.2 Engaging nurses in medication safety research

A significant reduction of medications errors was reported after engaging nurses in the current study. The incidence rate of medication error per 1,000 patient admissions was reduced by 54.7% between 2014 and 2016 (from 41.5 to 17.9 errors per 1,000 patient admissions). The results from this study demonstrated greater reductions in medication errors in comparison to other published paediatric studies. For example, in a prospective, two-period cohort intervention study on paediatric patients, there was 32.5% ($p< 0.001$) reduction in drug administration errors after implementing instructions for appropriate drug administration and the introduction of a teaching and training programme (Bertsche et al. 2010). In a more recent prospective study using pre- and post-intervention measures, the authors found that a multifaceted educational intervention, including teaching and self-study, had reduced the medication error rate by only 18% for paediatric patients (Chedoe et al. 2012). More recently, Niemann et al. (2015) performed a three-step intervention program in an 18-bed paediatric ward in a university hospital. The full intervention program included handouts, a training course and a reference book for nurses, and the medication error rate was reduced by 26% ($p< 0.0001$), post-implementation of the interventions. Despite the fact that previous studies were similar to this current study, in terms of implementing a bundle of interventions to reduce medication errors, the

significant difference between the current study and previous ones was the way in which nurses actively engaged in every phase of the research. These previous studies (reported above) did not outline how the researchers actively engaged or consulted the nurses in developing or implementing the interventions. Thus, the active and explicit engagement of nurses in this current study could be the reason for the increased improvement in error rates.

The participation of nurses in this study increased their conscious thoughts about their practice culture, as highlighted in Phase One. Participation in research creates a greater awareness of individuals' lived situations and how their own resources can be used for development of positive workplace change (MacDonald 2012). Research participation also increases understanding of practice issues, the contributing factors and potential solutions (Gagnon 2011). Consequently, the increase in awareness motivates participants to improve practice by overcoming any identified barriers. Before participation in the ART, the nurses in this study were not aware of the medication error rate on their ward, as stated by nurses in the ART meeting, *"Never expected that we are making that many errors"*. However, nurses identified the contributing factors to the medication error rate on their ward and they were able to reduce the medication errors by overcoming these barriers. The following sections will discuss how the nurses managed to overcome A) workload and B) lack of engagement in medication error management, both contributing factors to improved medication practice and error rates on the ward.

Workload

The number of patient admissions to the ward increased by 14%, and the number of prescribed medications increased by more than 24%, between 2014 and 2016. Even with this increased workload for the nurses the medication error rate was reduced by 54.7%, as shown in IIMS in Phase Three. This result differs from the perceptions of nurses in a previous study, where nurses reported increased workload as a contributing factor to an increase in medication error rate (You et al. 2015). In this cross-sectional survey study, 312 ward nurses stated that the most common reason for medication administration errors

was the high workload. The nurses stated that the high workload caused inattentiveness, led them to take shortcuts, more mistakes were made, and the workload caused burnout. Despite the perception of higher workload being related to more medication errors, demonstrated in the You et al. (2015) study, in the present study the engagement of nurses in research and implementing the interventions actually reduced the complexity of medication administration and contributed to a reduced workload, in a period when there was a documented increase in both patient admissions and prescribed medications.

This reduction in medication workload could be further explained by the process of nurses being engaged in this study, because through this active involvement the nurses learned to develop their own strategies to cope with and overcome the high workload. Overcoming the workload and busy-ness level of the ward was evident in the results in Phase Three, where nurses were working in teams of two to plan their shift together, ensuring the medication trollies were stocked prior to starting the shift, and taking the initiative to stop disruption from doctors during medication rounds. As explained by one of the nurses, ***Sabrina***, referring to this part of engagement in the research, "*I learned that with a little bit of planning we will be fine and complete our work before the shift finishes*". The engagement in research provided the nurses with an opportunity to learn about how to improve their working conditions. Engaging nurses in research may raise their awareness about any restraining factors (i.e. workload) that may contribute to bad conditions (Fay 1987). When nurses participate in research, they learn how to analyse the working issues correctly and create an innovative solution to the situation at hand (Bernard 2004). Increasing awareness will lead nurses to find ways of improving their working conditions (Chang & Mark 2011) and enable them to challenge and reframe their current working conditions, such as workload (Lieshout 2013). The nurses in this study were successful in finding their own ways of improving their practice, by being more adaptable to a new workload and level of busy-ness instead of taking shortcuts in medication administration, as was evident in Phase One.

Lack of engagement in medication error management

The lack of nurse's engagement in managing incident reporting is the second contributing factor that may affect the medication error rate. Consequently, nurses were not learning from these reports, which may have contributed to the reporting of fewer errors than what was happening on the ward. In Phase One, nurses discussed their perceptions of what they considered a medication error, and what to report and not to report. The main deciding factor for the nurses to report medication errors was the severity of the error outcome, as one nurse stated during the Phase One focus group, "*I think the minority error is the stuff that gets forgotten, the errors that give people a scare is the stuff that gets filled in*". These results are consistent with a previous qualitative study that was conducted on nine publicly funded, primary healthcare clinics, where nurses' attitudes toward reporting errors made by themselves or colleagues were examined (Samsiah et al. 2016). The researchers found that, for some nurses, the decision to report medication errors was determined by the severity of the error outcome on the patient. They also found that harmful, or potentially harmful, errors were more likely to be reported than medication errors perceived to be harmless (Samsiah et al. 2016). In Phase One of the current research, it was evident that nurses held similar views to the findings of this previous study, however, after engaging in a collaborative approach facilitated by the AR, and implementing the changes on the ward, the way nurses looked at medication errors and what should be reported through the IIMS process changed. This change in perception on error reporting was demonstrated in Phase Three, with nurses indicating that they are more aware of reporting medication errors regardless of the severity of outcomes, as one nurse stated in a focus group session *"We learn from each other that it is ok to report any medication error*" (FG5, N4). This change in perception of the reporting culture could explain the slight increase in IIMS error reporting that occurred per 1,000 prescribed medications (0.7-0.8 errors) between 2015 and 2016. Thus, it is likely that the true frequency of medication errors remained static or was possibly reduced, given the increase in patient numbers and medications administered during this time, but the nurses were more likely to report the errors in Phase Three, than what they reported in Phase One.

A possible reason for the change in nurses' error reporting perception is that they became more aware of the importance of safe practice methods, such as reporting medication incidents, after they engaged in these research activities. This explanation is indicated by the improvement in domains from the SAQ, especially in the safety climate domain (from 76.8% pre-intervention to 79.68% post-intervention, which is almost in the green zone). This domain measures nurse's safety practice and the reporting culture on the ward, and the improvement in this domain may reflect the change in the reporting culture. A positive culture of reporting medication errors, that includes a collaborative teamwork culture, is critical in maintaining an environment where nurses feel supported to report patient safety issues. Nurses tend to report medication errors more frequently when they work in a supportive environment characterised by feedback about errors (Ammouri et al. 2015). Flynn et al. (2012) explored the relationship between characteristics of the nursing practice environment and rates of medication errors in acute care hospitals. The authors found that a supportive culture, where there is cooperation between the team members, was significantly associated with the prevention of medication errors (Flynn et al. 2012).

In the post-intervention phase and after participation in this research, the nurses themselves became supportive of each other and worked collaboratively to create a learning environment to discuss the incident reports and give each other feedback, as described by one nurse, "*Now, we can learn from each other's medication errors, our practice will get better ... rather than just pretend it hasn't happened"* (FG4, N1). Moon (2013) proposed a hypothetical model called "a map of learning", highlighting the importance of peer feedback and working collaboratively. Receiving feedback from peers can help in learning and provides everyone with the opportunity to see different perspectives, which may influence or fundamentally change the way participants analyse the knowledge (Moon 2013). Peer feedback is beneficial because no two persons have identical thoughts, thus, over time people develop different perspectives that they can bring to any situation (Xie, Ke & Sharma 2008). The nurses on the ward collected, analysed and discussed the incident reports every month, after establishing the Safety & Quality (S&Q) meetings in Phase Three, and this gave them the opportunity to learn together using feedback and discussion.

The nurses overcame the lack of a feedback culture on their ward by not only creating the S&Q meetings, but also tailoring them according to their learning needs and perceptions of practice. The nurses in the current study were aware that to create a supportive reporting culture, the S&Q meetings needed to have the incident reports de-identified, receive feedback from each other, and this was to occur without any input from the NUM. These factors have been described in a previous study that examined ways of improving voluntary reporting, with the study identifying the de-identification of reporting, no managerial input, and nurses receiving regular monthly feedback reports as important (Abstoss et al. 2011). All of these factors were implemented by the AR nurses during the S&Q meetings (Chapter Four, page 177). The following section will discuss these characteristics of the S&Q meetings.

De-identification of the reports

The new reporting culture on the ward resulted in nurses not being hesitant or afraid to report any incident, which could improve medication safety. This change in practice was explained by ***Ally***, *"The Safety and Quality meetings gave me the courage to discuss any incidents more openly - that it is not a blaming sort of thing anymore"*. This is in contrast to a previous quantitative descriptive cross-sectional study of 151 paediatric nurses, where the authors found that more than half of the participants (59.1%) tended to avoid reporting medication errors because they feared being blamed by their colleagues or management (Nkurunziza, Chironda & Mukeshimana 2018). Reporting medication errors is recognised as a challenge to professional credibility and peer relationships, especially in a group with a traditional culture of professionals such as nurses, where it is difficult to fill out documents concerning errors because this could threaten the nurse's reputation (Chiang et al. 2010), which could create anxiety among the nurses, preventing them from reporting their peers or themselves. In a study aimed at clarifying the factors associated with reporting nursing errors (interviewing 115 clinical nurses and nurse managers), the nurses reported that they were afraid of losing their honour and dignity, or being stigmatised (Hashemi, Nasrabadi & Asghari 2012). The authors recommended that the error reports should be de-identified and the nurses involved in these reports should be unknown to other nurses (Hashemi, Nasrabadi & Asghari 2012).

The results from the focus group sessions and the interviews in Phase Three of the current study showed that the nurses believed that the new reporting culture is fair because their reputation is kept intact. The nurses are not worried about being blamed in front of other nurses if they are involved in a medication error. Not disclosing the identity of the nurse reporting the incidents may relieve some of the social pressures that can result from peer relationships and stigma (Vrbnjak et al. 2016). Furthermore, adherence to reporting is driven by peer pressure and reputation (Sax et al. 2007). The outcome of de-identifying the reports is that the reporting nurses feel that their reputation is intact when there is an error, which motivates them to promote medication error reporting, in order to improve their current practice (Laschinger, Nosko, et al. 2014). Patient safety will only work if reputation-associated fears and anxieties that inhibit nurses reporting errors are kept to a minimum, such as de-identifying the report (Petrova 2010). This was achieved during the S&Q meetings, where nurses discussed the reports without identification of the nurse involved in the incident. The courage in reporting medication errors among nurses in this study is because they believed that the reporting culture on the ward had become more supportive, and therefore they were more likely to report errors.

Changing the role of the manager

The nurses in this study specifically requested the meetings be with the manager not present. Patricia and Emily had found in their education scenarios, as shown in the results of Phase Two, that the presence of the manager was a barrier for the nurses when discussing the issues. In the pre-intervention phase, the nurses believed that the collected error data serves the organisation's management and was not for their own learning. Management behaviour that affects nurses' disclosure of medication errors was identified as one of the most important barriers to reporting medication errors (Vrbnjak et al. 2016). This is similar to a cross-sectional, descriptive and analytical study, using a questionnaire, conducted among 100 nurses. According to the results of the study, the most important reasons for not reporting medication errors were related to managerial pressure (Bahadori et al. 2013). The authors recommended that managers should reinforce the culture of the importance of complete reporting, and provide feedback to the nurses that would then result in the nurses learning from these reports.

In the current study, after implementing the interventions the medication incident reports are firstly discussed privately between the nurses who were involved in the report and the NUM, to investigate the contributing factors of the error. The same reports are then de-identified when they are discussed with other nurses in S&Q meetings. This method created a balanced culture, by providing an opportunity for learning from the de-identified error reports, as well as confidential discussion of the incident with the nurse(s) who made the error. This approach of reporting and feedback may help the nurses feel that it is a safe reporting culture, and also give them the opportunity to learn as an outcome of the discussion of the reports among their colleagues. This is similar to the work of Boud (1985), who found that participants were more likely to be engaged in the learning process when a teacher was not present. This is what many nurses in the current study experienced as they freely discussed the incidents and felt supported by each other in the S&Q meetings, as ***Emily*** indicated "*I feel more looked after by the team than before"*.

The nurses were given space where they could learn, by managing the incident reports and finding solutions with a sense of freedom. This learning outcome was conveyed by ***Emily***, *"I can voice my opinion now and learn from reporting medication errors"*. Adult learners must have control over their own learning (Corbett, Francis & Chapman 2007). Adult learners are self-directed, take responsibility for their own actions, and resist having information imposed on them (Knowles 1978), especially from their managers (Kenner & Weinerman 2011). Consequently, avoiding having managerial input at the meetings led the nurses to have a sense of freedom to view errors as valuable learning opportunities to improve patient safety culture. This consistent approach is supported by a systematic literature review of 38 studies, where the findings indicated that nurses need to be educated, skilled in error reporting management and, if they are given support and training, they will be motivated to report errors (Vrbnjak et al. 2016).

The nurses who led the S&Q had the authority to access the IIMS reports monthly and decide for themselves how to run the meetings and discuss these reports. Nurses in the current study had the freedom and power to talk about different safety and quality issues without the pressure of the manager's presence. Having the nurses' voices heard about

concerns is essential, as this empowers nurses and supports them to improve healthcare safety (Van Bogaert et al. 2016). This is consistent with the findings of a qualitative study that explored the nurse manager's perspective surrounding the implementation of unit level shared governance. The authors found that the nursing managers believed that engaging nurses in creating a safe space for making decisions gave nurses the power to participate in managing their own practice and the opportunity to participate in decision-making (Cox Sullivan et al. 2017). Empowerment has been conceptualised in terms of freedom; freedom to make a decision with authority to change practice and have choices (Fulton 1997). The freedom of nurses in this study was achieved when they did not have management intervening in the S&Q meetings. The nurses had the freedom to discuss safety issues and come up with potential changes to practice.

This is consistent with a qualitative study that used semi-structured interviews with 11 RNs to explore their lived experience in a shared governance role (Ott & Ross 2014). The authors found that the nurses became more empowered to take initiatives aimed at improving their practice culture when they had an opportunity to share their opinions with their managers. Giving more power and authority to clinical bedside nurses may lead to an improved working environment, improved outcomes for patients and enhanced professional development (Ott & Ross 2014). The nurses in the current study became empowered to take responsibility for any mistake they might make, as shown in the increased number of error reports in Phase Three. The nurse's explanation of these results was because they were now working in a more positive environment, demonstrated in the semi-structured interviews in Phase Three. For example, ***Lucy*** stated, "*I became aware of reporting errors that can occur because of the supportive culture that it is not a shame and blaming sort of thing anymore"*. Empowered nurses may contribute to the clinical learning environment in a positive way, which contributes to improvements in patient care, patient safety and staff wellbeing (Kennedy, Hardiker & Staniland 2015).

Feedback

Prior to this research, each incident report was reviewed by the NUM and only discussed with the individual nurse concerned in the incident. Previously, there was no information given to the rest of the nursing team about the incident and no opportunity to discuss errors and/or learn from them. The engagement of nurses in this research enabled them to identify their need for more feedback about the monthly incident report. This led the nurses to develop and implement the S&Q meetings, to provide them with feedback on what was being reported. Feedback is defined as all actions taken by (an) external agent(s) to provide information regarding some work aspect(s) and has, for many years, been one of the widest spread interventions inside and outside healthcare organisations (Giesbers et al. 2015). Feedback from peers is known to lead to empowering staff to improve the safety culture in the unit (Laschinger, Nosko, et al. 2014).

Since the research implementation phase, nurses began discussing and analysing the incident reports together. Consequently, nurses were thinking of solutions to their mistakes as they received feedback from each other. The nurses in this study considered the S&Q meetings as an opportunity to provide them with the feedback they required to reflect on the errors and practice implications, and a process to improve practice, thereby encouraging them to report not only medication incidents, but any other safety issue they noticed on the ward.

A previous qualitative study, using focus groups with nurses, aimed to identify medication error reporting beliefs (Hartnell et al. 2012). Participants indicated they would report medication errors more frequently if they received feedback, as they could learn from their mistakes and then improve their practice safety (Hartnell et al. 2012). They concluded that this type of culture stimulates continuous quality improvements, which maintains a positive reporting culture. Consistent with this previous literature, the S&Q meetings in this research became a forum to provide the ward nurses with the constructive feedback they needed and was a place where they could voice their view and opinions about safety issues on the ward on an ongoing basis.

The impact of feedback extends beyond the teaching and learning process (Giesbers et al. 2015). Research with novice nurses has demonstrated the importance of feedback on their ongoing learning and practice (Duffy 2003). Feedback is essential for adult growth as it provides direction, and helps to boost confidence and increase motivation and self-esteem of new graduate nurses (Clynes & Raftery 2008). Rn (2000) aimed to identify third-year nursing students' perceptions of feedback in the clinical area. Findings suggested that if students are not offered feedback, they may compare themselves with more senior colleagues and evaluate themselves inappropriately. This can lead to decreased levels of student self-esteem which may have a negative impact on subsequent practice. Feedback allows for reflection in practice and offers an opportunity to reflect on practice (Rn 2000). This is consistent with a grounded theory study, where authors found that while constructive feedback may improve self-esteem, feedback associated with a learning plan will encourage students and new graduates to develop in the required specific areas (Duffy 2003).

Feedback does not only help staff to assess their own performance, it also serves as a platform for reflection on the incidents, sharing and exchanging information, thoughts and suggestions. Feedback facilitates the development of reflection and uncovers ideas to build upon (Quinton & Smallbone 2010). If learning from feedback is to be effective, it should be associated with reflection (Clynes & Raftery 2008). Eisen (2001) studied the role of peer-based learning in professional development and found that peer feedback sparked individual and joint reflection (Eisen 2001). In general, reflection is defined as a cycle of inquiry for the purpose of making meaning or finding solutions for a troubling situation or question (Xie, Ke & Sharma 2008). In Phase Three, the nurses in this study received constructive feedback and an opportunity to reflect with their peers consistently in the S&Q meetings. For example, the nurses collected the IIMS report every month and brainstormed the contributing factors. In this process all nurses were able to have input, reflect upon, and share their knowledge and experience, and then suggest potential solutions for each incident. These steps are presented in the meaning of reflection. As nurses can reflect on the incident report during the S&Q meetings, they may learn from these reports, this, in turn, may result in them avoiding making similar errors and thinking more critically about their practice, leading to improvement.

Reflecting on and analysing material, in order to improve practice, is central to deeper learning (Quinton & Smallbone 2010). Learning from incident reporting encourages nurses to use these reports as a mechanism of nursing quality improvement (Chiang et al. 2010). This can be achieved by educating nurses about all aspects of the reporting process. Nurses become more confident if they know more information about why they need to report, and how the organisation's administration manages these reports once they are submitted (Hartnell et al. 2012). They are more conscious about patient safety in general, as ***Venus*** says, "*We make mistakes, but if we can learn from each other, then mistakes would be highly reduced".*

The S&Q meetings may also lead to the sustainability of the safety awareness culture in the unit, because they have been conducted and managed by the ward nurses who remain on the ward even after the research finishes. In the current study, nurses continuously received and used formal and informal feedback to improve their job performance during the monthly S&Q meetings. Thus, they were continuously thinking about and were aware of safety issues. This is consistent with a literature review aimed at developing a conceptual framework that illustrates how feedback can be related to nurses' wellbeing and quality improvement (Giesbers et al. 2015). The authors found that a supportive feedback environment contributes to ongoing and higher feedback orientation (receptivity to feedback) among employees (Giesbers et al. 2015). The provision of feedback helps nurses to understand the larger context of their performance, so that they can think of better ways of doing their job in the future, make more effective decisions, and take more appropriate actions to sustain a positive practice (Giesbers et al. 2015).

The nurses in this study recognised that medication errors were an issue on their ward and that this needed to be changed, as shown in Phase One. Following recruitment to the ART, the nurses started taking action (implementing the interventions in Phase Two) to change and move to a new way of working, such as managing their own workload and implementing the S&Q meetings. These changes occurred after the nurses identified the restraining forces for change (including workload, lack of engagement in managing incident reports), and used some driving forces to strengthen their changes. The main

driving force for nurses was their engagement in the research. This enabled the nurses to create a supportive and continuous feedback environment that may lead to sustaining the positive changes on the ward. When nurses work in an empowering working environment that fosters high-quality interpersonal relationships, mutual respect, and provides communication channels between nurses and managers, nurses become more satisfied with their work (Laschinger et al. 2014).

5.3 Partnering with consumers

The consumer is defined as someone who is getting something, perhaps without choice, and will have something to say if they do not like what they are getting (Boote, Telford & Cooper 2002). In the medication safety agenda, the consumer is the patient and their carer/family (in the case of a child patient). The concept of involving consumers in their own healthcare is widely accepted among healthcare professionals, but not always implemented (Keatinge et al. 2002).

Previous literature has identified a lack of engaging patients and their parents in healthcare. Tobin, Chen and Leathley (2002) conducted a qualitative study to explore the degree and quality of consumer participation within the health service in South Australia. The vast majority of consumers indicated they had been offered a minimal opportunity for participation at any level, ranging from individual treatment issues to involvement in service development activities or consumer-led projects. Similarly, an eight-month pilot study was conducted in urban, rural and remote areas of Australia, with 199 RNs and 36 consumers participating in the research. The results indicated that consumers had not been engaged actively in healthcare (Keatinge et al. 2002). A comparative design study was undertaken to explore the degree of concordance between patients' and RNs' perceptions of the patients' preferences for participation in clinical decision- making in nursing care (Florin, Ehrenberg & Ehnfors 2006). The authors found that RNs do not successfully involve patients in clinical decision- making in nursing care, according to their own perceptions, and not even to the patients' more moderate preferences of participation. The

authors concluded that a collaborative approach to include consumers in healthcare is necessary to improve the level of consumer involvement in patient care decision-making.

Consistent with previous studies, the literature review in this study (see Chapter Two) showed that families have not consistently been involved in the medication safety agenda (Alomari et al. 2015). To date, families/patients have not been included as key stakeholders in researching or developing effective interventions to reduce medication administration errors (Alomari et al. 2015). The literature review in the current study has highlighted that barriers to effective implementation of active consumer participation in patient care persist.

A possible explanation for the lack of consumer involvement in any partnership relationship with nurses could be the perception of power held by nurses. A qualitative study, using semi-structured interviews and observation, explored nurses' and patients' views regarding partnership in care in hospital and found that many nurses were unwilling to share their decision-making powers (Henderson 2003). It is important for nurses and patients to work as partners and endeavour to equalise the power imbalance that exists (Henderson 2003). One way to do this is for nurses to readily share and give information to patients and to be open in their communication with them (Longtin et al. 2010).

The findings of this current study indicate that families can be successfully engaged in the medication process as partners, providing consumers with the opportunity to discuss, ask questions and check the medication process, while the nurses are preparing and administering the medication at the bedside. This is evident in the results after the implementation of the interventions, with the engagement of families and the patients in the medication process significantly increased, as shown in the focus groups and the policy audit in Phase Three. The nurses reported that engaging families in the medication process was becoming an integral and normal part of their practice culture, "*The family seem able to be more involved and supporting staff while doing medication"* (FG5, N3). Additionally, the policy audit verified that families were more involved in the medication

process in the post-intervention phase. This is highlighted in Step 4 (which involved administering the medication in a similar manner to the parents' method while they are at home) and Step 15 (which involved explaining the medication process to the family), where the compliance rate of nurses involving families improved by 30% and 62% respectively in the post-intervention phase.

The increase in compliance with these two steps demonstrates that the communication between nurses and families improved and that nurses exchanged information with families and patients more in the post-intervention phase. Increasing communication between nurses and families may have been due to the decentralisation of the medication room, which was replaced by the four mobile medication trollies that are taken to the bedside. Consequently, the nurses became more visible to families and patients during the preparation and administration of the medication, which enabled parents to watch and observe the whole medication process undertaken by the nurses. Mirroring the findings of the current study, a previous mixed method study also found that changing the physical location of medications resulted in positive patient outcomes (Bennett et al. 2006). These authors found that after nurses changed their practice of preparing the medication inside a medication room to preparing medication at the bedside, nurses spent more time with patients and had better access to both the patient (for information and clarification) and the tools required to complete the task. They concluded that these factors would enhance work satisfaction and create a positive work environment.

Visibility of nurses to families and patients is an important part of improving partnership and communication between patients and nurses, because it provides patients with the opportunity to ask for immediate assistance when needed from nurses, thereby improving patient safety (Keys & Stichler 2018). From the observation results in Phase Three, nurses' visibility had increased with the use of the medication trollies, and families could listen, supervise and check the whole medication process. The increase in the visibility of nurses created a two-way communication channel where nurses and families could ask each other questions about the medication or any aspect of patient care. Contributing factors to improve nurses' communication with families and patients may include increased

visibility and opportunity to give educational support by nurses (Spence et al. 2010). These factors have been achieved in this study, by increasing the visibility of nurses with the implementation of the medication trollies, and the nurses were provided with knowledge, through participation in this research, that increased their awareness of the importance of including families in the care plan.

As a consequence, the nurses in this study found that a more positive rapport was created with families during the medication process, with one nurse describing this relationship as a *"Positive interaction"* (FG5, N1). Consistent with these findings, another study outlined that information and knowledge exchange creates a trustworthy relationship between nurses and families (Cooke 2005). In their qualitative research, Zugai, Stein-Parbury and Roche (2013) conducted semi-structured interviews with adolescent patients to explore their perception of their relationship with nurses. The patients described the positive relationship they were looking for with nurses should include nurses' visibility, well-timed interactions and knowledge exchange. The patients indicated that motivation to adhere to care was derived from such strong relationships with nurses (Zugai, Stein-Parbury & Roche 2013).

Open communication leads to empowering consumers to take an active role in their care plan. When patients are empowered, they may question nurses about their care (Bickmore, Pfeifer & Jack 2009). The first step in empowering consumers is for nurses to develop a positive relationship with patients through knowledge exchange (Henderson 2003). The empowerment of families in this study is evident in the results in Phase Three, where nurses themselves mentioned that patients and families now asked more questions about medication and shared their knowledge with nurses, as ***Sue*** stated, "*Families are asking us more about their child's antibiotic".* This will enable the families of patients to be advocates for their child's interests, on the basis of competence and confidence, leading to more emancipation in decision-making (Sahlsten et al. 2009).

The nurses in this study were motivated to engage consumers because they believed that involving families and patients could improve medication safety. This was expressed by nurses in the focus groups in Phase Three, for example, "*The family seem able to be more involved"* (FG5, N3). This may reflect an increase in the nurse's awareness in involving the family and the patient in the medication process, and this increase in awareness could be related to their participation in this AR study. Participation in AR increases awareness through learning and reflection (Titchen 2015). This was evident in the focus group data in Phase Three, as ***Sara*** stated, "*I know now the importance of involving the parent".* Promoting awareness and empowerment of nurses can facilitate the notion of partnership with patients (Henderson 2003).

Nurses can work with families, using them as a source of knowledge and information, and improvements in safe practice may result from these new, successful and effective relationships with families. Many parents living with a child with a chronic condition develop extensive expertise in managing their child's condition and can work in partnership with health professionals (Smith, Swallow & Coyne 2015). Patient knowledge (or in this case parent knowledge) is an essential aspect of partnering with patients, which can improve nurses' practice, decision-making and patient outcomes (Longtin et al. 2010) and, in particular, be a way of *"supporting junior staff"* (FG5, N3). This is demonstrated in Phase Three of the current study (ward nurse interviews) when nurses stated that parents could be supportive of them, improve medication safety, and increase the nurse's confidence. These findings are congruent with a recent qualitative Australian study that interviewed 20 nurses, to explore their views on patient participation in nursing care (Tobiano et al. 2015). The nurses believed that patients and families positively contributed to improving care outcomes, because they were able to provide information on a variety of topics, asking questions and voicing concerns about themselves and care (Tobiano et al. 2015).

In particular to medication safety, nurses in this study considered parents and patients as a safeguard for their practice, as one nurse stated, families observing medication administration were "*seeing them being double checked"* (FG2, N1). This is consistent

with a mixed-methods ethnographic study of 43 nurses, that aimed to identify system factors that facilitate and/or hinder successful medication administration in three inpatient wards (McLeod, Barber & Franklin 2015). The authors found that patients and families can provide a defence barrier to medication error when the medication is prepared at the bedside. The study found this was especially the case because patients act as an active resource of information (volunteering information about their medicines without prompting) and secondly, patients act as an additional checking process with the intention to check the medication being prepared or administered. Therefore, the ability and the knowledge of families, and their positive collaborative relationship with nurses, developed as part of the interventions in this current study, may have had a direct impact on the reduction of the medication error rate.

Despite the positive aspects of working in partnership with families, nurses still face difficulties in supporting and facilitating parents' participation (Harrison 2010). Factors affecting nurses engagement with consumers may include inadequate staffing levels and managerial support, lack of recognition of the impact of families on nurses' workload, and inadequate communication skills (Coyne et al. 2011). The qualitative study conducted by Coyne and colleagues (2011) used open-ended survey questions to identify paediatric nurses' perceptions of engaging families in the healthcare agenda. The nurses stated that to implement a nurse-consumer partnership successfully they needed adequate resources and appropriate education about how to engage families, and they needed to receive support from managers. In the current study, nurses became more aware of, and learned about, engaging families in the medication process through their participation in the ART and the related research activities. They had support from the research team and from management to implement the changes, through purchasing the trollies and modifying the organisation admission forms and medication policy. This support enhanced the families' engagement in the overall medication process.

Healthcare organisations need to consider patients and their families as partners, rather than merely receivers of healthcare. Healthcare is designed not only to treat patients, but also to comfort, engage, and empower them (Charmel & Frampton 2008). In this study,

engaging families and patients became part of the organisation's policy after the ART nurses participated in changing and updating the medication policy. Further, the nurses in this study invited the parents (and patients) to participate in the medication process on admission, by using the new admission form (see Chapter Four, page 176). Nurses are ideally placed to take the lead in facilitating open communication and providing encouragement to consumers to pursue any interest they may have in active participation (Lammers & Happell 2003). The changes on the ward led by the ART nurses created an environment where families and patients were more engaged, because they could see, check and participate in the medication process, as a result of the medication trollies being used at the patient's bedside which, thereby, enhanced medication administration transparency.

5.4 Building research capacity

One of the aims of this research was to explore and understand how nurses would engage in, conduct and lead research, to change and improve current practice. This aim was achieved as the nurses were engaged in every stage of the research process. They had different levels of involvement in the research, from participating (e.g. completion of SAQ, attending focus groups) to being part of the ART, where they led and conducted their own data collection and interventions. The perception of the nurses during participation in the ART progressed from being uncertain and confused about what they could contribute to the research team to taking the role of leading aspects of the research. In this section, the focus will be on how 1) working with nurses as active members of the research team helped to build research capacity, 2) the research study design enabled the team to overcome the barriers of engaging nurses in the research and 3) how they were supported to build their research capacity.

The ART nurses reported in ART meeting minutes and the interviews in Phase Two that they were anxious and they had fears and feelings of uncertainty about their participation, and how they could be engaged and productive in the research project. These feelings could be explained by the fact that these nurses are highly competent, confident clinicians

on the ward, but when they joined the ART they were suddenly faced with unfamiliar terminology, time-consuming processes, and were without proper training or resources, all of which left them feeling overwhelmed. Working in conditions of ongoing uncertainty with limited knowledge can be stressful and disorientating and is not conducive to the facilitation of an active research culture (Jackson 2005). Additionally, it is noted that clinical nurses may feel vulnerable when placed in an unfamiliar arena of research (Jones & Gelling 2013).

The ART nurses related these feelings to restraining factors that prevented them from participating in research. Due to lack of engagement in a research project previous to this study, the nurses identified that lack of knowledge and lack of time and support from the organisation were barriers to engage in research activities, as they indicated in the interviews in Phase Two. For example, ***Sarah*** stated, *"Because I've never been involved in research, so I saw it as a challenge".* Consistent with these findings, previous studies identified that lack of research knowledge, lack of time, and the perceived absence of organisational leadership support are barriers to including nurses in research (Loke, Laurenson & Lee 2014). These restraining factors should be eliminated in order to achieve a positive change outcome (Shirey 2013). Without an enabling environment to participate in or lead research, nurses are unlikely to either demand research training opportunities or initiate research examining nursing practice and health system challenges (Edwards et al. 2009). It is clear in the current research study that strategies were implemented to address each of these highlighted barriers. This section will discuss how this research overcame the barriers related to lack of knowledge, lack of time, the relevance of research topic and engagement of nurses in the research process.

Lack of Knowledge

Lack of research knowledge of nurses was due to the fact that they had never worked or engaged in any research project before and, indeed, had never been invited to participate in a research project. They had little interest in learning about research when they studied their degrees at university, saying that it was "*something scary and difficult" **Lorraine***. This resulted in a lack of research knowledge and skills. To address this at the early stage of this study, the ART nurses were provided with open and easy access to the researchers

as a way of supporting their ongoing development as researchers. The availability of myself and other experienced researchers, who kept in regular contact with the ART nurses, went some way to resolve the negative feelings of nurses regarding their participation in the project. This is consistent with a qualitative study that sought to describe the facilitators and hindrances associated with RN led research in US hospitals (Patterson et al. 2013). The authors analysed the comments from the Hospital-Based Nursing Research Requirements and Outcomes national survey regarding facilitators and hindrances of conducting nursing research in hospitals. Results showed that 95% of the participating hospitals identified the presence of a research mentor as the top facilitator (Patterson et al. 2013). The results also showed that clinical nurses who have mentors to learn from are more likely to stay engaged in research and to conduct future research of their own. In a more recent study, the authors concluded that clinical nurses interested in participating in research are more successful when they have access to mentorship and guidance (Scala, Price & Day 2016). It is noted that the expert researcher must be present, available, and approachable to other novice researchers, to encourage them to ask questions about the research process, such as data collection and analysis (Berger & Polivka 2015). The ART nurses in the current study found that research mentorship increased their research knowledge, as one member stated in one of the ART meetings, "*Working with a team of researchers enabled us to improve research knowledge"*.

The support from an expert researcher to a novice researcher will enhance positive attitudes toward conducting and collaborating in research (Hurst 2003). Brown, Johnson and Appling (2011) found that the percentage of nurses who would initiate a research study increased from 26% to 34%, after working with research experts in a research team (Brown, Johnson & Appling 2011). While this is a small increase (8%), it is a move in the right direction. The regular support for the ART nurses positively influenced their perception of research, and they improved their research skills and gained more knowledge to continue to engage with the research journey.

The nurses linked the research knowledge they gained from participation in research to improved self-confidence and ability in improving their own practice through research. By participating in the AR process, participants can create knowledge which is

simultaneously a tool for education (Balakrishnan & Claiborne 2017). Mentoring and teaching novice researchers builds their confidence and builds their research capacity, as ***Sandra*** indicated, "*I feel that I am more confident in my ability to participate in future research projects"*. The education that resulted from participation in the AR led the nurses to raise consciousness of their own practice issues and encouraged them to think critically about resolving concerns of their everyday lives (Balakrishnan & Claiborne 2017). The nurses became more confident to challenge their current practice and to take initiatives to improve their own medication culture. This was found in the meeting minutes' results in Phase Two, where the ART nurses stated that after they "*have a direction forward*", they felt motivated to work harder in the research.

Participation in AR provides a learning opportunity and leads to empowerment and owning the new practice of the participants (Waterman et al. 2001). This is consistent with a previous quasi-experimental pre- and post-test study that assessed change in 111 nurses' attitudes about research, after participation in research (Brown, Johnson & Appling 2011). Nurses were asked to answer a pre-intervention/post-intervention questionnaire to assess their perceptions about research. The authors concluded that participation in the development and implementation of a mentored research study, through learning from members of the research team, was an effective strategy to empower clinical nurses to incorporate research into their professional practice (Brown, Johnson & Appling 2011). Nurses who perceive themselves to be empowered are more likely to effectively use research in their work practices (Donahue et al. 2008).

The ART nurses began to think about improving other aspects of their work through research, which in turn gave them considerable ownership of the project, which is evident in Chapter Four (journey map results). Nurses implemented a bundle of interventions by themselves with the support of the broader ART (see Table 4-3, page 174) because as ***Emily*** stated, "*it is ours*". This is consistent with a mixed method pre- and post-intervention study that sought to explore the feasibility of nurses learning research by doing, through active engagement in the research process (Clifford & Murray 2001). The questionnaire and focus group results indicated that learning research skills through active

engagement was more appropriate for nurses than learning through tutorials. They also found that the direct involvement in research increases nurses' ownership of the research outcomes (Clifford & Murray 2001). As nurses increase their research skills and knowledge related to their practice and become more confident, they will own the research outcomes (Jones & Gelling 2013; Wilson & McCormack 2006).

Lack of Time

The ART nurses in this study also had concerns about lack of time, as they were working as clinical bedside nurses and, therefore, perceived that they did not have time to participate in a research project. Lack of time decreases nurses motivation to build research capacity (Pager, Holden & Golenko 2012). The ART nurses had concerns that lack of time would prevent them from participating effectively in the research, as shown in the interview responses in Phase Two. To resolve this issue, nurses were given fully paid study days to participate in ART meetings and collect and analyse data. Taking nurses off the ward and giving them the necessary time to collect data minimises their work pressure and allows them to focus more on the research activities (Burnett et al. 2012). The importance of protected time to support nurses participation in research is a key principle to enable research capacity building of nurses (Moore, Crozier & Kite 2012). Such arrangements may reduce barriers to research participation and enable skills and enthusiasm to be developed (Edwards et al. 2009). A cross-sectional study was conducted with clinical nurses and allied health practitioners to explore the enablers and barriers to research capacity development (Pager, Holden & Golenko 2012). The authors found that supporting clinical nurses and allied health practitioners to conduct research, by quarantining time, was more likely to produce better outcomes for research capacity building, as they could use the time to learn and improve their research skills. Consequently, providing allocated time away from direct patient care enabled nurses to be more efficient in enrolling study subjects and completing assessments (Burnett et al. 2012).

The Relevance of Research Topic

Another barrier to build research capacity identified by ART nurses in this project is the relevance of research to practice. When nurses were discussing the results of Phase One during the feedback sessions, they realised that medication safety was a relevant issue on

their ward and needed to be improved. The relevance of research topics to healthcare ensures that clinical staff are enthusiastic about the research and stay invested in the study (Scala, Price & Day 2016). Empirical evidence suggests that nurses are more likely to engage in research if they have a better understanding of the situation and see the importance of improving their own practice and decision-making (Cooke 2005). Wiener and colleagues (2009) conducted a survey examining how to involve bedside nurses in creating research priorities. They found that asking nurses what research topics they were interested in created a sense of ownership of the project, especially when the research topics were relevant and interesting (Wiener et al. 2009).

Consistent with the literature, in the current study the realisation of the ART nurses of the relevance and importance of the topic (medication safety) was one of the motivators to join the ART, especially after they saw the results of Phase One. The nurses believed that medication safety is related to their practice and needed to be improved, as this nurse stated in the ART meeting "*I think this research project is very necessary to reduce the medication error rates in the ward"*. Making the research topic relevant to practice, by asking nurses about their research interests and creating research studies based on their responses, increases the likelihood of their participation (Scala, Price & Day 2016). As Nixon and colleagues (2013) found in the United Kingdom, consulting and involving clinical nurses throughout the research cycle increased their opportunity of highlighting the importance of the research topic and lead to empowering them in research activities (Nixon et al. 2013).

Participation in AR can increase the awareness of participants about the relevance of the topic (MacDonald 2012). During participation in AR, reflection creates a self-awareness which enables participants to give voice to topics that are important to them (Corbett, Francis & Chapman 2007). The inclusiveness of nurses in AR has the potential to improve practice and to enhance the sense of belonging and empowerment of participants (MacDonald 2012). The ART nurses were motivated to engage in this research after they became aware that their medication practice needed improvement, as highlighted by ***Lorraine*** in Phase Two, *"Medication administration is something I felt could have been done better, so I wanted to be a part of helping that evolve and change to optimise patient safety"*.

Engagement of Nurses in the Research Process

Support for nurses from the organisation is crucial for the promotion of research among nurses and enhancing the research culture (Laschinger, Read, et al. 2014). The nurses in this study linked the lack of resources and lack of organisation support as barriers to engaging them in the research process, as shown in the perception of unit and hospital management domains in the SAQ, administered in Phase One. Kanter's theory of structural empowerment describes the influence of organisation support on increasing nursing confidence to change their beliefs and perceptions about engaging in research (Kanter 1979). According to the theory, employees' power can be enhanced through knowledge and information, access to resources, support from peers, freedom to be innovative, visibility of the role, and relevance of the job functions to the mission. All these manifestations were achieved by the ART nurses, as evident in the journey map and ART nurse interviews, reported in Phase Two results (see Chapter Four). The ART provided the nurses with support from the NUM during all phases of the research. The support included time off the ward, changing the roster to accommodate the ART nurses and promoting the research activities. This support motivated the nurses to increase their production of research, and increased nurse autonomy, satisfaction and professional development (Berger & Polivka 2015; Kanter 1979).

As a result of overcoming the barriers that prevent nurses from building their research capacity, the ART nurses became more willing to do further research in the future, as they had learned research skills that encouraged them to join other research projects. ***Venus*** expressed this sentiment when she reflected on her participation in the ART, "*I feel that I am more confident in my ability to do research in the future".* Research skill development increases research activity and enhances positive attitudes toward conducting future research (Cooke 2005).

The interest in participating in future research was also noted by other ward nurses (not members of the ART), who showed enthusiasm in learning and engaging in future research projects, as ***Lucy*** said, *"Research is really important, and it obviously has a massive impact on what we do. Yeah, I like being involved in that kind of thing"*. The interest of the ward nurses could be related to their experience of research outcomes and

improvement in their practice. AR explicitly sought and worked with the knowledge of practitioners on the ward, while raising the awareness of the importance of research and improving practice in a facilitatory way (Balfour & Clarke 2001). Increased interest in research among the ART and ward nurses may result in the promotion and sustainability of the research culture on the ward. The research culture on the ward became more sustained due to the ART nurses developing the required research skills that they could continue to use on the ward after the research finished and the external researchers left the setting. The sustainability of a research culture can be achieved when it is associated with education and on-site clinical research champions (Manchester et al. 2014). Embedded researchers, such as nurses, have more influence on other people, as they are remaining in the units after the principal researchers leave the setting (Scala, Price & Day 2016). The organisation may need to develop nurses internally to establish the infrastructure necessary to promote, sustain, and involve nurses in research (Berger & Polivka 2015).

This study identified and implemented practical approaches to overcome the barriers of nurse's engagement in research. Providing the nurses with an opportunity to participate in this research, accompanied by open communication channels, providing time away from clinical work, and teaching nurses the relevance of research to practice, has positively changed the nurses' perceptions. Consequently, the nurses' confidence in research improved, as they became more research focused and the research culture was promoted in the unit, which contributes to the sustainability of the research outcomes.

5.5 Accountability of nurses after engagement in research

It is clear that the interventions implemented in the course of this study led to noticeable changes in nursing practice and culture, including:

- reductions in medication errors,
- better nurse compliance with hospital policy,
- stronger involvement of patients and their families in the medication process,
- improved nurse satisfaction, and

- increased interest in research.

Nurses attributed these improvements in their practice to having a voice and a chance to participate in research. Due to this participation, nurses felt empowered to improve their own practices and to sustain these improvements. Empowering nurses is an essential strategy for assuring high-quality patient care (Laschinger, Nosko, et al. 2014). During their participation in the research, the nurses were encouraged to voice their concerns, express their opinions and feelings, and offer suggestions about medication practice. The nurses' empowerment went hand in hand with their accountability. This section discusses the relationship between these concepts and the findings of this study.

Accountability is defined as a three-dimensional concept, including the perceived expectation that professionals will take ownership of their decisions (responsibility), will make their actions clear (transparency), and will agree to be judged in accordance with accepted values in society (answerability) (Leonenko & Drach-Zahavy 2016; Manuel & Crowe 2014; Srulovici & Drach-Zahavy 2017). After implementing the interventions, the nurses in this study showed a high level of *responsibility*, when they reported more medication incidents in Phase Three than what they had reported in Phase One, as shown in the increased number of IIMS error reporting (0.7-0.8 errors) between 2015 and 2016. This indicates that the nurses in this study are becoming more *responsible* as they are reporting more errors. In regard to *transparency*, the nurses are now preparing the medication in front of the patient and their families after implementing the medication trollies, this is considered transparent action because the families can monitor, supervise and question the whole medication process. Despite the de-identification of incident reports discussed in S&Q meetings, the nurses still were *answerable* and accepted the evaluation of their practice by other nurses when reporting on incidents. In the post-intervention phase, the nurses accepted feedback and judgement, as ***Ally*** explained, *"I am not afraid to be questioned by the NUM because the process to report errors is not a shame and blaming thing anymore".* The change in attitudes and behaviours of nurses on the ward, resulting from the interventions designed by the ART nurses, demonstrated that they had a greater sense of accountability for their actions regarding medication practice.

Previous literature identified a number of prerequisites to achieve a high level of accountability of staff (Laschinger & Wong 1999; Scrivener & Hooper 2011). Firstly, the nurses need to be supported in terms of resources from the organisation. Organisational support in the form of structural factors, such as access to information, support, resources, and opportunity in the work setting, have an influence on employees' accountability (Laschinger & Wong 1999). When staff feel they have enough support, they are more likely to feel more accountable, as professionals, for client outcomes (Scrivener & Hooper 2011). The nurses in the current study stated during the focus groups in Phase Three that they had more support, in terms of physical resources, in the post-intervention compared to pre-intervention phase. This resulted in an increase in their satisfaction with the new working culture, as evident in the improvement in the working conditions domain (SAQ) in the post-intervention phase, leading to being more accountable for their practice. Organisational support has a positive personal impact on the accountability of the nurses, who then became more productive and effective in meeting patient needs (Laschinger & Wong 1999).

Additionally, nurses perceived empowerment as a prerequisite of accountability (Leonenko & Drach-Zahavy 2016). When nurses feel empowered in their work practice, they can take pride in being transparent about the way they carry out their practice (Scrivener & Hooper 2011). The empowerment of nurses in this study was achieved as a result of their participation in this AR, with nurses commenting in meetings in Phase Two that they "*can make a difference in practice*". The purpose of AR is to foster participants' empowerment, through participation and learning (MacDonald 2012). Thus, nurses in this study became empowered to improve their medication practice, which can then lead to an increase in their accountability. Nurses empowerment and accountability for outcomes were related to their ability to be effective in getting their work done and contributing to improving their safety culture (Laschinger & Wong 1999).

Finally, a prerequisite to accountability is having power and confidence. Accountability develops in environments where people feel they have control over their situations and choose to accept the associated control (Manuel & Crowe 2014). Ingersoll (2007) argued

that it makes no sense to ask people to be accountable for something they do not control or to give people control over something for which they are not held accountable. He points out that accountability without appropriate power is unfair and can be harmful. In this study, nurses were given authority to run and manage the S&Q meetings by themselves and to review the medication policy after they participated in the governance committee. These two opportunities may have provided the nurses with the authority and power they needed to improve and change their own practice. Nurse participation in shared governance leads to greater autonomy among nurses, decision-making influence, self-respect and prestige, and more positive attitudes toward their work (Barden et al. 2011). When accountability is associated with authority, stress levels among nurses will be decreased and job satisfaction will be increased (Laschinger 2008; Laschinger et al. 2010). This is reflected in the improvement of job satisfaction (83.48% to 85.77%), stress recognition (73.9% to 78.33%), and team climate (84.64% to 87%) domains of the SAQ in Phase Three. Also, the nurses in the current study reported increased satisfaction with current practice, as well as the working environment on the ward appearing more relaxed and quieter, as shown in the observations in Phase Three, "*The ward is very calm, every two nurses having the medication trolley at their assigned patient room*" ON2**.** This resulted in the emancipation of the ART nurses, encouraging them to take action and to sustain this in their new practice culture. With freedom comes responsibility and commitment to contribute to and sustain the organisation's shared vision (Singh 2013).

In summary, the nurses in this study showed a level of accountability after they engaged in the research. Their responsible, transparent and answerable behaviours are evident in the data. To achieve an accountable culture, a number of conditions need to be addressed which may include organisational support, empowering the staff, and giving them the authority to change their practice. This increased accountability may result in safer healthcare practice, as it creates a safety culture and reduces negative outcomes for patients, nurses, and organisations (Srulovici & Drach-Zahavy 2017). This research provided learning opportunities for nurses that increased accountability, thereby improving overall medication safety.

5.6 Strengths of the study

This research promoted the development of long-term strategic research alliances between researchers and the organisations in which they work, enabling the application of expert research knowledge to the local problem of medication errors and the impact this has on patient safety within the organisation. The AR design of this study is strengthened by the high level of staff engagement and motivation during the change process and implementation stages. Staff engagement and input provided meaningful insight into the ways that the delivery of medications and parent engagement could be improved. Nurses' engagement was crucial in this study, because they are key people in the medication process. Due to their position at the bedside and their closeness to the patients, nurses are considered the most knowledgeable professionals about contextual factors and they were able to determine the feasibility of the interventions and their implementation in reducing medication administration errors.

The nurses and researchers in this study were brought together in an ART to examine data about current medication practice and develop, implement and evaluate targeted interventions for improving medication management. The project developed strategies and processes that 1) engaged nurses, 2) enabled collaboration between nurses, researchers and families, 3) fostered openness, 4) promoted research culture and 5) created a supportive space for reflection, to reduce the risk associated with medication administration for vulnerable children. These points are key to the success of the research as discussed earlier in this chapter.

This project has had an impact on the nurse's culture concerning medication safety and the importance of research. The implemented interventions increased awareness of nurses as they became more conscious of the medication safety culture on the ward (enlightenment), for not only performing safe practice but also for supporting others to do so. Additionally, the nurses changed their perception of research, because they were engaged as key players in the research over a long period, which represented an opportunity for them to gain the skills and knowledge to undertake research. Consequently, the nurses became empowered to engage in future research projects. The empowerment of the nurses led them to challenge current practice issues on their ward, enabling them to take actions by developing, then implementing, the targeted

interventions on the ward to improve their practice. Empowerment enabled the nurses to overcome previously perceived barriers, to both improve practice and to engage in research.

This project provided an inclusive view of social, behavioural and cultural factors that impacted on medication management, and health policy more broadly, rather than a narrow focus on one or two aspects in isolation. The novel data collection and analysis framework reflected this more global view of practice. Using AR as a research design allowed the researchers to collaborate with and engage the nurses in AR. It provided the nurses with key information about their practice issues, that not only informed the development of interventions, but also assisted them in developing strategies to support the implementation of the interventions in practice. Also, the use of mixed methods embedded within an AR framework enabled the derivation of a rich and productive data set that informed the study progress (Fielding 2012). The multiple sources of data provided the nurses with a comprehensive picture of their practice, which then increased their awareness about their own medication practice, leading to improved understanding of the medication practice culture, issues and solutions. This produced a learning opportunity for nurses, which then empowered them to lead the research, by developing and implementing the targeted interventions.

Throughout the study, close attention was paid to methodological rigour. The principles of consultation with stakeholders, ensuring a high rate of participation and empowerment, were closely observed during the project design, implementation and analysis, through careful documentation and a reflective journal. The benefits of this approach, regarding empowerment and capacity development, are reflected in the study findings and further discussed in the final chapter, where the researcher's reflections are presented.

5.7 Recommendations for future research

One way of building on the findings of this research would be to identify multifaceted quality improvement interventions, which include well-designed tools and strategies to assist nurses in the proactive identification, assessment and communication of issues that relate to medication management. Such interventions are vital for organisational learning, improving patient safety and ultimately preventing adverse outcomes.

The findings have identified the necessity of providing regular feedback about nurses' performance and safety issues in the hospitals, clearly laying out the division of responsibility, improving the feedback processes, and increasing system resilience. This provides fertile ground for further research to identify the mechanisms by which healthcare organisations can provide consistent, anonymous, non-punitive feedback to nurses. Future research should focus on exploring the ability of nurses to give and receive feedback and comparing the effectiveness of this mechanism.

Research is needed at the organisational level to ask nurses about their interest in, and attitudes toward, nursing research. Institutions must ask nurses what types of research studies would be meaningful to them and link these research projects to organisational and unit-based strategic goals. Involving clinical nurses in what makes research important, or why it may add value to their professional practice, will likely provide new insights into measurable outcomes of engagement.

Research that engages bedside nurses working with experienced researchers and focusing on issues that are important to practice can influence patient safety outcomes. Collaborative, inclusive and participative approaches to research are vital in clinical practice change, and AR can provide these characteristics. This type of research gives a venue for nurses to voice their experience and perceptions, which may assist in improving practice and sustainability of outcomes. Future research should engage and empower

clinical bedside nurses to participate in research that contributes to building the research capacity of clinical nurses.

5.8 Conclusion

This AR study has demonstrated that a critical, collaborative and participatory approach to change can result in improved safety of medication administration. The implemented interventions enabled nurses to engage families more actively in the medication process and established a positive relationship that can support nurses in improving the safety of medication administration. The nurses became more aware of the importance of medication safety and engaging in research to improve practice (enlightenment).

The inclusiveness and active engagement of nurses in the research resulted in raising awareness of medication practice (rituals and routines) that may impact on care, such as working around policies and poor error reporting. These restraining factors were compounded by the small physical environment for preparing medication, lack of resources and lack of feedback, and impractical policies and guidelines. The nurses were supported to look at the issues through engagement, and learning through participation in AR. The nurses then believed that change could occur and practice could be improved, after they reflected on their existing practice culture and learned the research skills they needed to improve practice (empowerment).

The nurses were given the knowledge and skills, supportive environment, opportunities to participate, time, and resources, to work on issues that were relevant and important to their practice (driving forces). Then nurses were empowered to change current practice as they implemented the interventions. With support from the ART, nurses were free to act and lead, to implement and evaluate the effectiveness of the interventions they developed (emancipation). The nurses became committed to maintaining the positive practice on their ward, and to be more accountable for this practice (refreezing). All of which resulted in improved outcomes for patients (e.g. reduction in medication error

rates), families (e.g. enhanced involvement in the medication process), staff (e.g. research capacity building) and the organisation (e.g. testing of strategies that support a safety culture).

The limitations of this study and researcher's reflections are presented in the following chapter, which concludes the thesis.

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Chapter 6 Researcher reflections, limitations, and conclusion

6.1 Researcher reflections

Since I began working as an RN, I believed that any initiatives to develop nursing practice should come from nurses themselves. As a nurse, I am the closest to the patient and spend most of my time at the patient's bedside. Furthermore, I will be the one, with other nurses, to actually apply the changes in practice. However, in reality, changes often come from managers and are imposed on nurses, with limited consultation (Scala, Price & Day 2016). Many of the changes made in this manner are unrealistic, not applicable, outdated and, in some settings, unsuitable (Hamer & Cipriano 2013). Consequently, nurses often choose not to follow them (Rycroft-Malone et al. 2010).

When I explored the issues around engaging nurses in research, I found that research recommends that nurses are engaged in any change that impacts on them and their practice (Hamer & Cipriano 2013). However, I questioned myself why, in the everyday reality of clinical life, are nurses not engaged in research? If they are not, how can they be included in research? What are the difficulties that nurses face if they engage in research? This was the motivation for me to be engaged in a study that aimed to work alongside bedside nurses as researchers, supporting them to make changes in practice.

From the beginning, I was conscious of the strengths that I could bring to the project. I was still working as a bedside nurse, I could relate to the nurses, understand their feelings, concerns and thoughts about the research and about the evidence-base that informs practice. At the same time, I could utilise my theoretical research background to support nurses to engage in research, I felt that I had much to contribute as part of a research team.

Due to my clinical experience and theoretical background, I was able to position myself as the "link" between the researcher and the clinical bedside nurses, especially when it

came to making sense of the data and sharing the results of the research. Researchers who are familiar with the field are able to retain an awareness about the issues of participants (Borbasi, Jackson & Wilkes 2005). This made me closer to the nurses on the ward, where I understood their perceptions and work issues, which, therefore, could enable me to assist them during the research process. However, while my previous qualifications provided me with the theoretical knowledge of the required research skills, I lacked research experience, which worried me. I realised at an early stage that having a passion for nursing research was not enough; I needed to advance my research skills and the application of my knowledge in research practice.

I became aware that there are so many little details, of which I was unaware, when it came to conducting research, especially when my role was to support nurses through their own research journey. I recognised that research in practice is about more than what is found in books and literature. I had feelings of ambiguity at the beginning of the data collection period, due to my lack of research skills. For instance, I was not sure how to perform practice observation or how to lead a focus group session. I was concerned because I was not sure if I would succeed in this research or be able to reach the conclusion of the research. Many questions were on my mind: Could I actually fulfil the research plan? How would I collect and analyse data? How would I best support the nurses and work with the research team, who themselves were very experienced? I was concerned that I would not be a productive member of the team.

To deal with these concerns during the AR study, I continuously reflected on the research process to learn more about the practical side of research and to deal with any issues that emerged during the study. I systematically undertook reflective practices, to help me to improve my own performance (Mohan 2017). If learning is to occur from practice, then reflection is vital (Balfour & Clarke 2001), and I needed to learn at all stages of the process. Reflection is a purposeful activity which is more than just a recall of events; it is the way by which the need to change for the better evolves (Mohan 2017). Reflection, therefore, is not just about understanding, but also about changing practice and gaining insight into building nursing theory in and from practice. In using an AR approach,

reflection is an integral component of the process, to understand the interpretations of the process and its impact and outcomes (Badger 2000), and it is imperative to study reflection and learn as part of the AR process.

During the study, I documented my reflections in a journal, which I used to highlight my experiences as a researcher. My main objective for using the reflection journal is to reflect on my actions, feelings, knowledge and beliefs, to learn from my experience as a researcher and to guide my actions and decisions during my research journey. Reflective journaling offers a means of dealing with emotionally demanding research and enhances the credibility of the research process (Fisher 2011). Gibbs' cycle was used as a framework for my reflection journal (Gibbs et al. 1988). A thematic review of my reflective entries revealed that I identified three main practical research issues as part of my PhD journey: 1) being part of a research team, 2) the art of observation, and 3) the insider/outsider dilemma. Each of these issues will be explored below. This section will conclude with a discussion of who I am now as a researcher, my learning and key insights. Quotes from my reflective journal will be used to highlight my research story.

6.1.1 Being part of a research team

In the early phase of this study, I was neither skilled nor experienced in data collection and analysis. As mentioned earlier, I had never had an opportunity to collect or analyse data in real life. My research training was only in theory, while studying my undergraduate and postgraduate degrees. I was working with an experienced research team, which added more burden on me. I felt at a significant disadvantage due to my lack of research experience. At some stages, I felt isolated and unsure of how my efforts would add meaningful input to the project as a whole. Lack of practical skills of novice researchers can lead to exhaustion and some might give up, as they are in doubt of their ability to be productive in a long research journey (Marks et al. 2017). Below is a quote from my journal, where I was reflecting on how my experience in undertaking research, and the opportunity to work with experienced researchers, was impacting me,

"Today, we had the first research team meeting to decide our research plan. The team members were amazing and friendly, I did not have any input and was not confident to say anything and did not know what to say. They were all very experienced researchers." [Fieldnotes, p3]

Reflecting on this issue, I discussed these feelings with my supervisors. This enabled me to increase my awareness of the advantages of being in a research team. The members of the study's research team had a remarkable wealth of experience in conducting research and they were willing to take me on the team, so this meant I would have an opportunity to learn from them also, and this was evident from that first meeting. Each researcher brings their own individual talents and knowledge, which must be meshed into the framework of a working team (Priest et al. 2007). Additionally, reflecting on being part of the team made me more conscious of my own strengths, as my current clinical practice and my qualification in research would enable me to be the "link" between the team and the nurses on the ward, which was a perfect fit for my role in this project. As the study design was AR, the project relied on the collaboration of all those involved (Wilson et al. 2016), including the research team and clinicians.

The team worked as a source of knowledge for me while I learned the practical side of conducting research. During our face-to-face planning meetings, the team provided me with excellent support and information, as I prepared to facilitate the data collection in Phase One. They helped me in planning my work to achieve my data collection on time, joined me in collecting the data in the field (in the preparation period), and reviewed and checked manuscripts and the ethics application.

"*Having the research assistance with me today to do the pilot observations was very useful training for me. As we both finished the observation, we compared our data and then the research assistance gave some advice on how to report the data and what to do.*" [Fieldnotes, p4]

They guided me to use time management tools, such as a diary or a log book, and assisted me in identifying the resources available in the organisation to help me to improve my research skills. Consequently, this assisted me to settle quickly and find the answers to my questions very easily. As soon as I started learning these skills, my self-confidence increased, and I began to work more independently.

I found that having a resource person available increased my own personal and research confidence. My main supervisor acted as a great and true facilitator for this journey. She encouraged and assisted me in reflecting on my strengths and weaknesses, to be able to identify my learning needs. I was encouraged to increase my knowledge and enhance my skills by attending workshops, such as a five-day course about practice development. Research literature emphasises the importance of a skilled and experienced facilitator for successful research training (Wilson et al. 2016). The skills, knowledge and resources of my research team helped me to gain confidence in each phase of the study. One of the biggest supports I received from my supervisor was helping me to obtain a scholarship and funding to assist me in continuing this journey. This support assisted me in focusing on my learning and research, and not worrying so much about juggling between work, family commitments and my study. It has been shown that supporting nurses financially is an essential step in developing their research capacity (Segrott, McIvor & Green 2006).

I often had difficulty delegating while working with the team. I wanted to learn as many research skills as possible. I asked other team members to let me participate in extra research activities, such as additional data collection and analysis, as well as my assigned research duties. I wanted to learn. As a result, I felt overwhelmed by the amount of work I had to do and found my own research tasks were lacking and often overdue. After reflecting on this issue, I became aware that working in a team requires clear role descriptions and identified tasks that should be completed within agreed timeframes. I realised that I not only had to focus on my learning goals, but also needed to prioritise the duties required of me from the team. With careful planning, I was able to learn to balance the workload so that I could achieve both what I had to do as a research team member and my own researcher learning goals (Bailey 2007). I became more efficient at research

tasks as my confidence grew, along with my knowledge of data collection methods, processes and analysis approach.

6.1.2 The art of observation

A practical example of my early realisation of the gap between my theoretical knowledge and practical experience of research occurred in the practice observation in Phase One. I learned that the richness of the information in observation depends on the skills and subjectivity of the researcher (Caldwell & Atwal 2005). I had prepared myself by reading some articles and textbooks on how to do practice observation in the clinical area. I decided to visit the ward a few times prior to starting the data collection, to introduce myself to nurses and to orientate myself to the physical environment of the ward. I attended several staff meetings to provide information to staff about what the study would involve. I was warmly received by the nurses, who seemed genuinely interested in seeking to improve clinical practice through research.

Despite this preparation for the observation stage, on my first day on the ward, I was lost, confused, and did not know where to start and when to take notes. I was confused about whether to observe the nurses while they prepared the medication inside the medication room or to follow them to observe how they administered the medication to the patient. The medication room was too small even for the nurses, and I did not have any spot to "*fit in*" [Fieldnotes, p5]. I was not sure what to observe, as all the nurses on the ward were preparing the medication at the same time; it was chaos, as everyone was rushing and working simultaneously to give the medication on time. Additionally, the doctors' round was happening at the same time, causing more chaos and noise.

> "*I felt lost. I don't know how to observe all those nurses at the same time. I was anxious as I don't want my presence to add more burden on nurses. The medication room is so small to fit everyone, not sure how to fit in this environment.*" [Fieldnotes, p5]

It is not easy for the observer to enter unfamiliar social settings, such as a new ward, to collect data (Mulhall 2003).

I had many feelings of confusion, hesitation and ambiguity. The scene on the ward was hectic, and I wanted to catch the whole picture of everything that was happening at this busy time. At the same time, I did not want to interrupt the routine of the ward or to stand in a position where I might block anyone from doing their work. I was also not sure about what the nurses were thinking about me. I was continuously asking myself "do the nurses think I am *watching them*?" It was an uncomfortable feeling and position to be in. Most observers entering the field for the first time express a sense of fear or hesitancy (Mulhall 2003).

I was frustrated because I was unable to collect all the data I wanted. After a thorough discussion with my supervisor, and reflection on what happened on that day, these feelings were resolved by capturing notes and reflecting upon them. Reflection minimises the selectivity of observers, enhances their research skills, and enhances their objectivity (Caldwell & Atwal 2005). As a result of my reflection, I learned that I could not observe all the activities that are happening on the ward at the same time. As stated in the observation data in Phase One, the ward is very crowded, especially the morning time; the noise level is very high with every nurse, pharmacist and doctor rushing to get their work done. I realised that it is hard to catch the whole scene together without a plan or a structure for my observation. Thus, I decided to divide the observation into three stages: one week to observe nurses while they were inside the medication room, the second week to observe the nurses from the medication room until they administered the medication to the patients, and the third week to use the audit tool I had previously developed, based on the medication policy.

In order to avoid any interruptions to the nurses' routines and to gain social acceptance of my presence on the ward, I decided to put in place a number of strategies. Firstly, the key to this was that from my position as an outsider, I did not want my observation to cause any distress to the nurses. This type of action would be considered unfair and had the potential to damage the rapport I had previously developed with nurses, during the information sessions (see Chapter 3 Method, Phase One). I approached the nursing

educator to negotiate the most appropriate time for observation. Undoubtedly, as observed by other researchers, flexibility and pragmatism are central and valuable features of participant observation (Bailey 2007). I sought to fit around the nurses' schedules, making myself available across the three shifts (morning, evening and night), including weekends. Fitting into the research setting represented not only a period of blending in, to minimise disruption to the day-to-day activities on the ward, but also becoming familiar with the individual needs of nurses (Burns et al. 2012). "Fitting in" also represented an uncomfortable period of identifying where best to position myself within the physical layout of the ward. The aim of this step was to avoid any disruptions to the nurses' work. I initially hung around the perimeter of the medication room and outside the patient rooms, until I felt a level of acceptance.

Another challenge I faced during my early days in practice observation was encouraging the nurses to accept my presence and to build a trusting relationship with them. I sensed a certain level of suspicion among the staff, concerning what the study might involve and who the findings might be reported to. It was clear that they did not see me as one of them, because there was a concern that I would be making judgements about the quality of the nurses' practice and reporting this back to management. I outlined these concerns in my journal, expressed in the below quote. Cultural acceptability of researchers usually involves considerable time and effort, and it is a constant endeavour to reach the required acceptance from participants in research sites (Mulhall 2003).

> "*Just as I was leaving after I had been discussing the project with the nurses, there was some reference made by one of the nurses. She asked if I was watching them or monitoring their practice."* [Fieldnotes, p7]

This quote highlights the issue of what the nurses perceived I may be doing. I assured the nurses that I was not watching them, and that the goal of this observation is to learn from their experience, so that I and others might gain insight into practice issues. The nurse's concern did not appear to impede the observation.

Remaining in an observer role when the nurses asked me clinical or medication-related questions was especially challenging. For example, during an observation of a discussion about preparing an antibiotic medication, between a junior resident doctor and one of the nurses on the ward, they asked for my opinion on how to prepare the medication. I politely told them that my role was as an observer, not a clinician, and that I could not provide them with this information as it was not my role. During and after this incident, I was torn between telling nurses how to prepare the medication, as I knew this information and this would save them time, and maintaining my role as a researcher observing what they do. Despite maintaining an observer position, the relationship formation meant that observing nurses without supplying them with the additional information felt like 'spying', or what some researchers describe as 'exploitative interloper' behaviour (Adler 1987). However, I explained to the nurses and doctors that the reason for not engaging in this discussion was that it was part of my data collection and I wanted to observe what they do. By avoiding engaging in this discussion, I kept a positive relationship with nurses and maintained my position as an observer.

I felt a strong desire to avoid adding additional tension, by assuring nurses that confidentiality was a high priority and that the study was not about the individual practice, but instead aimed to capture the broad spectrum of practice. I repeatedly told the nurses that I am not *"watching you"* [Fieldnotes, p9] and that I was *"observing the medication practice*" [Fieldnotes, p9]. With time, this strategy appeared to ease the tension. After the second week of observation, the nurses' level of acceptance increased, and I felt more settled. I felt my presence on the ward had nearly become normal for the nurses, as they stopped asking me for my feedback on their medication practice. Also, I felt more welcomed by the nurses as they started calling me by my name.

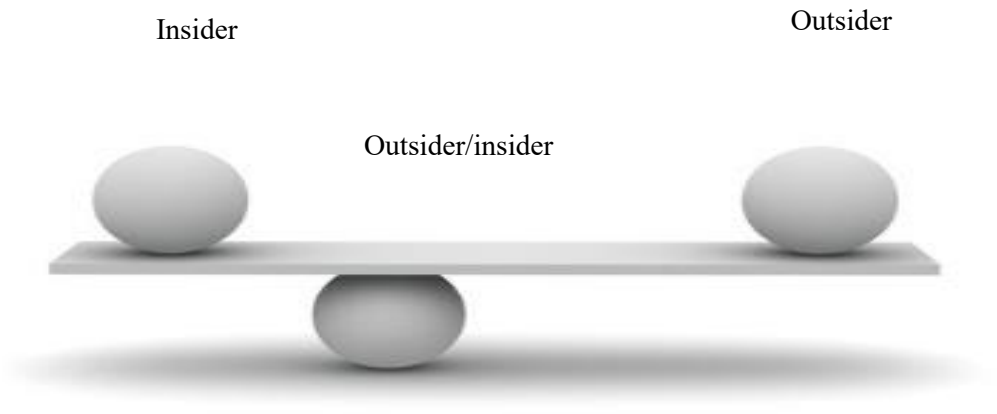
> *"Today is the first day that many nurses called me by my name and saying "Good morning Albara", I feel much more relaxed."* [Fieldnotes, p10]

6.1.3 The insider/outsider dilemma

Another challenging issue I faced in my research involved my identity as a researcher. I was identified as both an insider researcher, because I am a clinical bedside nurse who shares the same issues and culture as the participants, and an outsider researcher, who is unfamiliar to the participants and the organisation (the research setting).

An insider researcher is characterised by the researcher sharing the characteristics, roles or experience of the study participants (Simmons 2007). In contrast, the outsider researcher does not share the commonality of research participants, including her or his membership status concerning those participating in the research (Allen 2004). Understanding the difference between the roles is essential to any investigation (Dwyer & Buckle 2009). The practice of qualitative research requires careful attention to issues of identity and social status, and the role of the researcher in the generation of data (Allen 2004).

The balance is a metaphorical see-saw. Keeping the see-saw balanced was, at times, very difficult and it required training, skills and reminders. Insiders and outsiders sit at opposite ends of the see-saw; whereas I sat in the middle, trying to keep the balance between both sides. The tools that allowed me to achieve that balance were the reflective journal and reflective discussions with my supervisor and other members of the research team. Whenever I critically revisited my journal, I gained further insight and was enabled to keep the see-saw balanced. Figure 6-1 pictorially represents the insider/outsider see-saw.



Source: http://www.cedarrecruitment.com/wp-content/uploads/2014/06/fulcrum.jpg

The conflict between the two positions produced feelings of uncertainty and fear, and I had many questions I needed to reflect on to resolve those feelings. For instance, how would the nurses accept my presence on the ward? Would they consider me as an outsider researcher or insider nurse? How could I maintain a balance between both roles? Getting the balance right is often a challenging task (Simmons 2007). To deal with these concerns, I continuously reflected on the research process and used my notes as part of my learning journey.

There was no doubt that, at the beginning of the research, I had the feeling that I was a stranger to the nurses and the ward. I did not know anyone's name, nor how they worked, their staffing level, how busy they were, or their practice culture. It was difficult for me to have this feeling as "stranger" or an "outsider.

As discussed earlier in this chapter, I used the information sessions to introduce myself to the nurses and discuss what they could expect from me. I asked if they had any concerns about being part of the research. I also discussed my background, interests and values in nursing research. I indicated a level of understanding of the nurses' concerns and issues, not only on the ward but also in their general clinical life. These meetings had a direct

positive effect on myself and the nurses. The nurses started calling me by my name, and my presence was warmly received, as outlined in this excerpt of my reflective journal,

> *"I really enjoyed talking to the nurses today, this is the first time they did not ask me about observations and did not discuss my research. Instead we talked about holiday wishes and how hard it is to take annual leave."* [Fieldnotes, p8]

After a while, I found myself talking in a language of "we" and "us", I was becoming much more inclusive in the language I was using to engage people. Another factor that assisted in changing my role from that of an outsider to that of an insider was my clinical background. Despite being an outsider in the organisational sense, being a current clinical bedside nurse seemed to facilitate early acceptance of my regular presence on the ward. I realised I sometimes shared the nurses' experiences, opinions and perspectives.

Despite the potential that I would develop bias by becoming an insider researcher, there are many advantages associated with this role. Although an objective of the study was to observe the nursing medication practice, it was also important to prioritise the building of ongoing respectful and trusting relationships with study participants, by being mindful of how busy the staff were. Researchers should have the knowledge and skills to determine the best time for data collection and the busy-ness of the nurses, otherwise the researcher would not be accepted if they did not meet these expectations (Mulhall 2003). This strategy was successful; there were numerous opportunities for subsequent visits to gather rich data on very busy, understaffed shifts, with nurses who happily gave me permission to stay and observe. This experience did not limit data collection, in fact, it may have enhanced opportunities via mutual respect and trust. However, as the researcher, I needed to maintain an acceptable presence 'within' the social world (Burns et al. 2012) that I wished to observe.

I started to show more empathy for the nurses with regard to many issues they faced during their normal working days. I remember a particular example of me sympathising

with the nurses when they were shocked about a theme from a family focus group. During a family focus group there was a criticism of the nurses and the way they worked and, for some families, a mistrust in the nursing care. The nursing staff were saddened about this, and I found myself not only trying to support them, but as a clinical nurse I also shared their frustration at this feedback. I found myself upset and sad at the same time as the nurses, reflecting on what families said about the nurses and wondering if they were talking about all nurses on the ward. I was using words such as "*we nurses*" and "*those families*". I was taking a defensive approach and judging what families said as either "*right*" or "*wrong*", rather than analysing this data as a researcher. I forgot for a while that I needed to deal with this data in an objective way.

Also, over the study period, I became increasingly aware of the resource constraints nurses were working within, and I was sympathetic to the fact that the unit was short-staffed and often very busy. I was aware of the impact that this busy, under-resourced working environment had on staff optimism. I was able to relate to the nurses' frustrations and dissatisfaction, having previously worked in a bustling, understaffed hospital environment. As I listened to the stories of their issues with the workload, and their feelings of discontent and helplessness, I found myself relating with empathy.

I started to feel that I was part of the team, as my presence was increasingly accepted by the nurses. I found that staff would seek me out to ask advice on a particular clinical problem they were having. This resulted in further reflection on my position as a researcher.

> *"Today the staff were tending to check what I thought about particular clinical decisions they were making. During these discussions, I felt hesitant to participate as I normally would in a clinical setting, as I felt I would be stepping outside of my role as a researcher to engage in clinical decision-making discussions (on issues such as whether a particular medical recommendation was appropriate). I constantly felt in the midpoint between outsider 'researcher' and insider 'clinician'."* [Fieldnotes, p8]

It was difficult to balance the two roles. I tried to achieve the balance between being an insider where I have acceptance, trust and easy access from the nurses (participants) and, at the same time, keep a professional distance from the social activity of the nurses, so that I had fresh eyes, looking at the practices' bigger picture. I was mindful of the disadvantages of each role. Having a reflective journal throughout my study assisted me in achieving the balance, by acting as a reminder and an evaluation tool for myself, which prevented me from slipping entirely into either role. The process of reflexivity facilitated awareness of the insider/outsider experience (Adler 1987) and supported me to challenge myself when I became aware of blurring boundaries.

I took a dual approach as an insider/outsider researcher. While being an outsider provided me with an opportunity to observe the practice from outside and to see the bigger picture, being an insider gave me more acceptance and easy access to the organisation and the nurses. To gain the benefit of the two sides, I tried to get the balance right by undertaking regular reflection when I found myself slipping into either role. Enabling the insider and outsider aspects to co-exist simultaneously may expand the range of the researcher's 'tool bag' (Burns et al. 2012). I did a degree of juggling of the various characteristics of the insider-outsider experience, to achieve the desired level of familiarity with, and distance from, participants.

It was very useful to keep and refer to a reflective journal throughout the research journey. Reflection provided me with a continuous and ongoing learning experience, where I was able to define the issue and then find a solution. The reflective process enabled me to learn from my research experiences, by linking theory to practice. It assisted me to improve my understanding of my own feelings and influence in clinical practice. Consequently, I have the confidence and ability to investigate and appraise new ideas and opportunities.

6.1.4 Who am I now as a researcher?

Doing my PhD was not as easy as I thought. While I thought the research was only data collection, analysis and publishing papers, doing this research opened my eyes to another horizon. At the beginning of this research, I was lost and confused. I felt fearful of the mountain I had yet to climb, in terms of knowledge and skill development. I was not confident enough to voice my opinions during the initial research meetings. I was, at times, unfamiliar with the terminology, due to my non-English-speaking background. Also, I had only a vague understanding of my role in the research team and how to work with other people. It was very stressful at the start. It took me a few months to settle in and clearly identify my role in the research team.

The main issue was that I was thinking like a student, not as a researcher. I was only focusing on finishing my task within the timeframe; I was dealing with research tasks as though they were homework. This could have been because of my clinically driven focus, which made me enthusiastic to take action and get immediate results. I was always worried that someone was going to notice that no results had been produced. All the time I was thinking about and looking at the outcomes and results of any action. I wanted to see an impact and change in the surrounding environment, as a result of my research. In other words, I wanted to change the world with my research.

Now, I realise that research should not be hurried. The reflections, the ART meetings, and my supervisor helped in changing my perception and the way I was thinking. It was a relief to learn that quick results were not expected, especially in AR. With time, learning from my supervisors and reflection upon my journey, my goals changed and I clarified my role in the research team, and thought about and participated in different research activities to learn more research skills. I learned more about the progress of the research process and the timeline. This relieved some of the pressure and the research meetings became smoother as they progressed. I probably also relaxed a little more with each meeting, as I came to know the research team members and their roles.

Another factor that helped me in reducing my stress is that the project was well organised and had clearly defined elements. The research proposal and research plan had a clear timeline, elements, stages and goals. These assisted me in understanding the different phases of the research and my role in each one. Also, my supervisors assisted me to identify my role and encouraged me to think like a researcher and to be a more critical thinker.

Being a part of a larger study was instrumental in the development of my learning experience. By being supported to undertake all parts of the research process, I have gained experience that I could not have gained from books alone. I also feel that my research capabilities as a nurse have been enhanced. Working with other experienced researchers has benefited me, in learning to critically analyse the data, be reflective, and understand the value of the research. AR, as a method, also inspired me to be a collaborative, critical thinker, to value other people's participation, and to continually work to improve any situation.

As the study progressed, I developed interpersonal skills, such as delegation, negotiation and collaboration with other team members. I developed my skills in active listening and enabling questioning. I was able to offer constructive feedback in a respectful manner, while appreciating the differences in viewpoints. I have further developed my skills and knowledge, and these are relevant and directly transferable to clinical practice.

Engaging participants and consumers in research, especially nurses and families who usually lack research experience, is a hard task. I learned through reflection that practice development (PD) without the active participation of stakeholders would not be successful. PD ensures that all participants have an opportunity to participate in discussions about practice, and to challenge it, to not only change the practice culture but also to transform the culture and context of the care settings, with the aim to improve patient care (Gregory 2012). Therefore, promoting research and supporting nurses and families to join research is an essential and important step in practice development. For

this research, this was achieved by involving the nurses in the activities and decisions. Stakeholders need encouragement, empowerment, and to see that the research is relevant to their real clinical life. Before engaging stakeholders, researchers need to give them an opportunity to voice their needs and thoughts. The active participation of stakeholders in PD and sharing of experiences is integral to develop practice and ensure credibility of the researchers and changes (Gregory 2012). I learned that building trust between a researcher and the participants, and respecting the values and experiences of the participants, encourages healthy relationships and adds value to the research findings. I will be working to explore more practical ways of engaging participants in research, because I now believe participants are the main ingredient of successful research. Consumer engagement and practice development, by engaging stakeholders, will be an area of interest for me in the future.

6.2 Limitations of the study

One obvious limitation of this study was that it was based at a single site (one paediatric ward). Participants were not recruited on a national or international scale. The single site basis of the study may influence the transferability of the results to other contexts. This limitation, however, was balanced by the collection of data from multiple sources (managers, experienced nurses, junior nurses and families) and a rich description of the study process, which provided depth across different time frames (AR cycles one, two and three), for those who may wish to replicate parts or all of the methods used. The presentation of multiple data collection and rich and vigorous findings enhance the transferability to other settings (Graneheim & Lundman 2004). The study was also monitored on an ongoing basis by the research team members and my reflection journal, which enabled the establishment of study outcomes for multiple stakeholders (nurses, researchers, pharmacists, consumers and organisations). For this reason, multiple data sources ensured the trustworthiness of the study, as discussed in Section 3.10, page 126.

Bias was a potential limitation of this study. Self-reporting questionnaires, such as the SAQ, may introduce bias due to social desirability, which is the tendency for participants

to show a better image of themselves (Johnson & Onwuegbuzie 2004). The participants may believe the information they report (self-deception) or may fake their responses to obey socially acceptable values or to avoid criticism (Van de Mortel 2008). Socially desirable responses are most likely to occur to socially sensitive questions (King & Bruner 2000). To avoid bias in responding, this study used multiple data sets examining the same issue, and across different timescales, to reduce social desirability responding. Conducting practice observation was key in reducing social desirability, as it is capturing what is seen and heard from an objective viewpoint (Ligthelm et al. 2007). The observation of practice was conducted over three weeks, in both Phase One and Phase Three. The SAQ, focus groups and the interviews did not have any socially sensitive questions. Also, the researcher assured the participants that the data would be anonymous and confidential, thereby reducing the potential impact of the individual to self-report on favourable rather than true image.

The final limitation was the changes that occurred over the three-year study period. Transitions occurred on the ward, as new staff were employed, and committee members and research personnel changed. However, the formation of the research team remained stable, with the same principal researchers throughout the project and consistency of five of the six ART nurses, with one going on maternity leave then returning before the end of the project. Despite the personnel changes in the committee, clear handovers took place, and information on project processes and data were stored, to avoid any missing data. This served to reduce the impact of this potential limitation.

6.3 Conclusion

Medication error rates are a national and international issue, and comprehensive and sustainable solutions are urgently needed. Despite multiple attempts and interventions to prevent or eliminate them, medication errors still occur. Medication error rates are still considered a challenge in Australia and globally. This thesis is part of a large multidisciplinary collaborative study aimed at reducing medication administration errors in the paediatric inpatient setting, by bringing families and nurses to work together. This

thesis reported the data and the results of the nurses' participation in the project, while the findings on engaging the parents in the research are presented as part of the larger study, and are, therefore, only referred to in this thesis rather than reported upon.

The literature review in this study showed that there is a consensus regarding the factors that contribute to errors, but sustainable and effective solutions remain indefinable (Alomari et al. 2015). Despite the complexity of medication errors, the nurses prior to this study were rarely included as key stakeholders, in researching or developing effective interventions to reduce medication administration errors. The literature review in this thesis (Chapter Two) found that in order for nurses to both accept and adapt to the change outcomes, researchers and organisations need to overcome the barriers that prevent nurses from being engaged in the change process (Alomari et al. 2015). Finally, the literature review found that a well-formulated and collaborative change plan will encourage adaptation to change, rather than resistance to it.

Action research was used in this study and was a suitable approach due to its participatory principles that aimed to engage the ward nurses in a research team. This study took an innovative approach, by engaging nurses as researchers in the whole research process – from reviewing already collected data to implementing changes in practice. AR can reach an inter-subjective agreement between researcher and nurses, a mutual understanding of a situation, consensus about the action plan, and a sense of what people achieve they do so together. The engagement in this AR provided the nurses with an opportunity to learn and understand more about the barriers and facilitators of their medication practice. Using a mixed methods approach to collect the data provided the researcher and the nurses with a comprehensive picture of the medication practice situation. The nurses were able to reflect on the findings of Phase One, which increased their awareness of the taken for granted assumptions they have about practice and about the importance of improving the medication process on their ward (enlightenment). Participating in the ART empowered the nurses to improve their own practice, to ask questions and to challenge one another. After receiving support to enhance their research skills from the ART team, training, allocated time to perform their research work, and support from the nursing management,

they felt able to develop and implement five targeted interventions (emancipation). Each of these aspects, enlightenment, empowerment and emancipation, link directly to the intent of critical social science and the basis for this AR study. The interventions included implementing medication trollies, changing the medication administration time from 8 pm to 6 pm, implemented S&Q meetings, changing and updating the medication policy, and adding a section to the admission form (of the organisation) about engaging families in medication administration. These interventions led to a clear and evident reduction in medication errors, as outlined in the results section of this thesis.

The number of medication administration errors was reduced by implementing a multidimensional approach, which was the aim of this study. The medication error rate was reduced by 54.7%, despite the increase in the number of patient admissions (**↑ 14%**) and in the number of prescribed medications (**↑ 24%**). The nurses were clearly engaged, participated in, and, at a later stage, led the research. The implemented interventions created additional benefits that will remain on the ward long after the study finishes. Although reporting the results of engaging families was outside the scope of this thesis, this research highlighted the importance of engaging families and patients as partners in healthcare. Families and patients should be considered as a support and safety resource for nurses, to improve medication safety.

The study provides compelling evidence of dynamic collaboration and the creation of an enabling culture for the ward nurses. Engaging nurses in the research process, and giving them the opportunity to work with other researchers, resulted in changing their views of research and supported a heightened consciousness of its importance in clinical nursing. The experience of the AR nurses was then transferred to other nurses on the ward, which resulted in more nurses expressing their interest in undertaking research education and joining future research projects.

The study highlighted that nurses are able to conduct research if they are provided with the opportunity and support to do so. Participation in research gave the nurses an

opportunity to voice their concerns and to change their own practice. Giving nurses the opportunity to take the lead in this research led them to shape the research agenda, and have ownership of the research and change process, and this, in turn, may influence the long-term sustainability of the outcomes. The changes in nurses' perceptions about research for improving practice is evident, as one ART nurse stated, *"Working with the qualified researchers is very constructive and enables us to improve many research abilities",* leading to the nurses being motivated to continue improving practice through research.

This research resulted in raising awareness of nurses about their medication practice. After engagement and learning through participation in AR, the nurses were empowered to identify their needs, find solutions and improve their own medication practice. The nurses then took action that lead to changes in practice, engaging other nurses, and becoming accountable for this practice. Their commitment to sustaining the changes is evident, and to progressing other practice issues with their new found research skills and knowledge, as ***Sarah*** stated, *"Now, I've always got ideas going boom, boom, boom in my head"*.

Reflection provided me with a continuous and ongoing learning experience, where I learned from this journey how to link theory to practice, identify an issue in my research experience, avoid bias and improve my critical thinking. Consequently, I have the self-confidence to investigate and appraise solutions for any issue. My future goal is to help clinical bedside nurses discover their own voice and become empowered, by working collaboratively together to improve practice.

This research experience provided me with significant research training as a PhD student. I was involved in all phases of the project, collecting and analysing data and disseminating results. I gained core skills in strategies to increase the interface between policy, practice and research, with employment opportunities in both academia and healthcare organisations. I gained expertise in qualitative, quantitative and mixed methods research

approaches, and enhanced my skills in undertaking literature reviews, stakeholder engagement, technical and adaptive approaches to change, AR, methods of evaluation, and disseminating findings. I developed connections with the health department and a major provider of innovative complex healthcare, and benefited from exchange opportunities at John Hopkins University. The development of my research skills is evident in the following outcomes:

Publications:

- **Alomari, A.,** Wilson, V., Davidson, P.M. & Lewis, J. 2015, 'Families, nurses and organisations contributing factors to medication administration error in paediatrics: a literature review', *International Practice Development Journal*. vol. 5, no. 1.

- **Alomari, A.,** Wilson, V., Solman, A., Bajorek, B. & Tinsley, P. 2017, 'Paediatric nurses' perceptions of medication safety and medication error: a mixed method study', *Comprehensive Child and Adolescent Nursing*, vol. 41, no. 2, pp. 1-17.

Funds and grants:

- Health Research Student Development Award, 2016, of $3000, was used to attend and present at Enhancing Practice Conference in Edinburgh, Scotland in 2016.
- Westmead Volunteers Nursing Research Grant, 2016, of $10,000, was utilised to release me from my clinical work in order to collect and analyse Phase Three data.
- Edith Cavell Trust Scholarship, 2015, of $5000, was utilised to visit John Hopkins University where there is a world-leading program in patient safety and developing organisational safety cultures, as well as a strong emphasis on patient and family-centred care models. I had the opportunity to explore how medication safety (and safety culture) is measured and the strategies they are using for implementation and evaluation of safety initiatives.

International conference abstracts:

Presented two abstracts at the Enhancing Practice Conference in Edinburgh, Scotland in 2016.

- The tale of bedside nurses unconsciously falling in love with research.
- Paediatric nurses' perception of medication safety and medication administration errors.

"As individuals, we can make a difference, whether it is to probe the secrets of Nature, to clean up the environment and work for peace and social justice, or to nurture the inquisitive, vibrant spirit of the young by being a mentor and a guide."

— Michio Kaku

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APPENDIX 1 Literature Review (Paper one)

http://www.fons.org/library/journal.aspx

International Practice Development Journal

Online journal of FoNS in association with the IPDC (ISSN 2046-9292)

CRITICAL REVIEW OF LITERATURE

Families, nurses and organisations contributing factors to medication administration error in paediatrics: a literature review

Albara Alomari*, Val Wilson, Patricia M. Davidson and Joanne Lewis

***Corresponding author: University of Technology Sydney, Australia**
Email: Albara.Alomari@student.uts.edu.au

Submitted for publication: 6th May 2014
Accepted for publication: 1st April 2015

Abstract

Background: Medication error is the most common adverse event for hospitalised children and can lead to significant harm. Despite decades of research and implementation of a number of initiatives, the error rates continue to rise, particularly those associated with administration.

Objectives: The objective of this literature review is to explore the factors involving nurses, families and healthcare systems that impact on medication administration errors in paediatric patients.

Design: A review was undertaken of studies that reported on factors that contribute to a rise or fall in medication administration errors, from family, nurse and organisational perspectives. The following databases were searched: Medline, Embase, CINAHL and the Cochrane library. The title, abstract and full article were reviewed for relevance. Articles were excluded if they were not research studies, they related to medications and not medication administration errors or they referred to medical errors rather than medication errors.

Results: A total of 15 studies met the inclusion criteria. The factors contributing to medication administration errors are communication failure between the parents and healthcare professionals, nurse workload, failure to adhere to policy and guidelines, interruptions, inexperience and insufficient nurse education from organisations. Strategies that were reported to reduce errors were double-checking by two nurses, implementing educational sessions, use of computerised prescribing and barcoding administration systems. Yet despite such interventions, errors persist. The review highlighted families that have a central role in caring for the child and therefore are key to the administration process, but have largely been ignored in research studies relating to medication administration.

Conclusions: While there is a consensus about the factors that contribute to errors, sustainable and effective solutions remain elusive. To date, families have not been included as key stakeholders in researching or developing effective interventions to reduce medication administration errors.

Implications for practice:

- Future solutions to reduce medication errors need to take into account staffing levels, skill-mix, stress and workload
- Organisations need to provide appropriate policies and guidelines as well as access to supportive technology and ongoing educational support aimed at reducing errors
- Engaging nurses, doctors, pharmacists and, most importantly, families in developing practice through person-centred approaches is vital in order to improve the culture of medication safety and reduce medication errors

Keywords: Medication administration, error, nurses, families, children, organisation

APPENDIX 2 Permission from International Practice Development Journal

Dear Albara

Thank you for your email.

We don't have a problem with permission to use the IPDJ article, although we would of course ask for appropriate referencing.

Communications and Administration Officer

From: Albara Alomari [mailto:Albara.Alomari@student.uts.edu.au]
Sent: 21 December 2017 00:26
To: ipdj <ipdj@fons.org>
Subject: Re: Families, Nurses and Organisations Contributing Factors to Medication Administration Error in Paediatrics; A Literature Review

Dear Debbie,

I have published a paper with title "Families, Nurses and Organisations Contributing Factors to Medication Administration Error in Paediatrics; A Literature Review. " in IPDJ, 2015. I would like to ask for a permission to include it in my thesis.

Looking forward to hearing from you

Regards

Albara Alomari

APPENDIX 3 WCCAT observation tool

Observation: Date: Time started:

Observer:

Time	Observation Notes	Questions Arising

the children's hospital at Westmead

Corner Hawkesbury Road and Hainsworth Street

Locked Bag 4001

Westmead NSW 2145

Sydney Australia

DX 8213 Parramatta

Tel +61 2 9845 0000

APPENDIX 4 Information sheet

INFORMATION SHEET
(Staff)

Reducing risk for vulnerable children by engaging families in the medication safety agenda

Investigators:

Professor Wilson Valerie	UTS, SCHN	02 9845 3093
A/ Professor Beata Bajorek	UTS	02 9514 8301
Professor Doan Hoang	UTS	02 9514 7943
Albara Alomari	UTS	

We would like to invite you to participate in a study aimed at improving medication management. Please read this Information Sheet through to the end and if you have any questions please do not hesitate to contact the research team. You may be required to sign a Consent Form if you decide to participate in certain aspects of the study.

What is the study about?
This study is a 3-year project that will bring staff and families together to develop, implement and evaluate interventions to improve medication management in the hospital and also prepare families for care of their child at home. The study will be conducted at The Children's Hospital at Westmead. Preschool age patients with complex health care needs will be the population of interest for this study because of the need to support their parents in understanding the complicated medication management needed to care for their child at home.

To achieve our aims for this study will be collecting information from the ward and from you in a variety of ways. We will be collecting information through: a survey (Safety Attitudes Questionnaire), through observing medication administration practice, focus groups and interviews. This data will then be used by an Action Research Team (ART) to develop, implement and evaluate interventions aimed at improving medication safety on your ward. The ART will consist of staff, parents and researchers. Outlined below is the different ways in which you might participate in this study.

1. Completing a survey (Safety Attitudes Questionnaire) which will take approx. 15-20mins. The goal of the survey is to understand the attitudes of staff towards safety in the clinical environment. By completing the survey, you will be providing consent for us to use the de-identified information you provide.

2. Observations will involve a member of the research team coming to the ward to observe medication administration practice. The observation is aimed at understanding the processes and systems of medication practice and how these are conducted; it is not about identifying the practice of individual staff members. The research team member will be trained in conducting observations. Prior to the observation you may let the research team member know if you do not want to be observed and they will exclude you from the observations. An observation schedule will be agreed upon prior to the observations commencing.

3. Individual interviews are when a member of the research team asks you questions directly and records your responses (digital tape). You will be asked to complete a consent form if you elect to participate in an individual interview.

4. Focus groups are group interviews facilitated by a member of the research team. Your responses at these will be recorded and used only by the research team for the study. You will be asked to sign a consent form if you decide to participate in a focus group.

5. The Action Research Team (ART) is a group of interested people who will work together to review information around medication management and come up with ways to make sure that we have the best medication management process possible. The ART will consist of parents, staff and researchers working together, sharing their experiences, developing and testing ideas for change. The ART will establish a regular meeting schedule that suits the needs of members (e.g. 1 hour every 4-6 weeks over a 12-18-month period). Staff who join the ART will be supported by a key member of the research investigators (see above); staff are not required to have any research experience. Joining the ART is a considerable time commitment, however we hope that the experience will provide staff with new skills and experience relating to medication safety, developing, implementing and evaluating practice innovations, undertaking the research process and dissemination of findings.

We will hold information sessions for staff considering joining the ART to provide them with further details about the study and answer any questions they may have prior to them making a decision on whether to join the group or not. If you decide to participate in the ART, you will be asked to sign a consent form.

Who can participate in the study?
A staff member who has been employed on the ward for at least four consecutive weeks.

Are there any benefits to participating in the study?
There are no known benefits for participating in this study. We hope that the interventions from this study will inform improved medication safety programs in the hospital setting and in the community and reduce medication errors.

Are there any side-effects and risk associated with this study?
There are no known side effects associated with this study.

Do I have to take part in the research?
Participation in this study is voluntary. If you do not want to participate that is ok. You do not need to answer any questions you don't want to. If you begin the study and decide you do not wish to continue, you can stop at any time.

What will happen to the information I tell you?
The information you give us will only be used to develop interventions to improve medication safety for children. No one outside of the ART team will be allowed to access or use the de-identified information provided by you. You will not be able to be identified in any paper or reports that will be produced from this study.

The answers to the questions you give us will be stored on a computer that only the researchers can look at. The survey you will fill out will be kept in a storage archive for five years and then it will be destroyed. Your name will not be stored with any information you give to us.

If you have any questions about this study, please do not hesitate to contact us.

This project has been approved by The Sydney Children's Hospital Network Human Research Ethics Committee. If you have any concerns about the conduct of this study, please do not hesitate to contact the Executive Officer of the Ethics Committee (02 9845 3066) and approval number: LNR/14/SCHN/32

This study has been approved by the University of Technology, Sydney Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research which you cannot resolve with the researcher, you may contact the Ethics Committee through the Research Ethics Officer (ph: +61 2 9514 9772 Research.Ethics@uts.edu.au), and quote the UTS HREC reference number: 2014000218. Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

This Information Sheet is for you to keep.

APPENDIX 5 Policy Audit

The medication Process

(Based On the Medication Management and Handling-CHW)

Medication Process Step	Achieved (Yes)	Not Achieved (NO)	Not Observed (NA)
Prepare and administer one medication for one patient at any one time.			
The same nurse must prepare record and administer the medication ordered.			
Two nurses must **independently** check the medication process for all IV, IMI, SC and oral medication***i**.			
Wherever possible administer medication at the same/similar time and in a similar manner to how the parent/carer does at home.			
Written and clear order (Right medication), if unclear, do not give.			
Right medication.			
Right chart.			
Right Patient (Identification band), right weight and/or ideal body weight if the patient is overweight.			
Right dose. Where required the dose should be calculated by 2 independent personal. If not sure refer to the available resources such as MIMS, CHW drug handbook.			
Right time and date.			
Special precaution (allergies and confirm with the parents), confirm both brand and generic names, check dilution and administration rate for IV medication and **DOUBLE CHECK** pump settings.			
Right rout (The route is prescribed in the medication chart), the oral medication that require a syringe to deliver the medication **MUST** be in an oral syringe. IV access must be checked prior administering the IV medication.			
Does the medication require double check? (if unsure check with team leader or look it up) **(IV, IMI, SC, oral and rectal & vaginal drugs)**.			
For IV medication, the medication is to be taken to the patient in an individual tray by both administering and checking nurse.			
Explain clearly what happening to the child and/or their carer.			
The two nurses must witness the administration of the medication and sign the medication chart upon completion of the administration.			
Ensure privacy and comfort of the patient.			
All additives solutions prepared must be accurately and adequately labelled.			
The equipment's taken to the bed side are taken away at the end of the procedure and discarded appropriately.			
If the IV medication is administered over a period of time, the maintenance of the infusion may be carried out by more than one nurse with adequate handover.			
Withheld or missed doses are to be documented on the medication chart using the code on the medication chart.			
The two nurses must witness sign the medication chart upon completion of the administration.			

APPENDIX 6 The action research team nurses semi-structured interview guide (Phase Two)

Topic Areas

Definition of research

Reasons for joining the ART

Feelings and thoughts prior to joining the ART

Strategies to overcome negative feeling during the AR

Improvement and achievement of nurses

Influence of research on practice culture

Personal growth

APPENDIX 7 Ethical approval

The Sydney children's Hospitals Network

care, advocacy, research, education

Contact for this correspondence:
Research and Development
Ethics & Governance Administration Assistant
Phone: (02) 9845 1253
Facsimile: (02) 9845 1317
Email: ethics.schn@health.nsw.gov.au

Corner Hawkesbury Road
and Hainsworth Street
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http://www.schn.health.nsw.gov.au/
ABN 53 188 579 090

14 March 2014

Prof Valerie Wilson
Nursing Research and Practice Development
The Children's Hospital at Westmead

Dear Professor Wilson,

HREC Reference: **LNR/14/SCHN/32**

Project title: Reducing risk for vulnerable children by engaging families in the medication safety agenda

Sites Listed: The Children's Hospital at Westmead

Thank you for submitting the above project for single ethical and scientific review. This project was first considered by the Executive of the Sydney Children's Hospitals Network Human Research Ethics Committee (HREC) at its meeting held on **6 March 2014**. This HREC has been accredited by the NSW Department of Health as a lead HREC under the model for single ethical and scientific review.

This lead HREC is constituted and operates in accordance with the National Health and Medical Research Council's *National Statement on Ethical Conduct in Human Research* and *CPMP/ICH Note for Guidance on Good Clinical Practice*.

I am pleased to advise that the HREC Executive granted ethical approval of this research project.

Your approval is valid from the date of this letter.

The documents reviewed and approved include:

Document	*Version*	*Date*
Covering Email		24 February 2014
Scientific Protocol	2	February 2014
The Information Sheet, Staff Interviews, Focus, AR, SAQ	2	February 2014
The Information Sheet, Parent Interview and AR	2	February 2014
The Information Sheet, Parent Survey	2	February 2014
The Information Sheet, Staff Interview, Focus, AR SAQ	2	February 2014
Workplace Culture Observation	1	February 2014
Children's Hospital Safety Climate Questionnaire		
Safety Attitudes Questionnaire Making Practice Visible, The Workplace Culture Critical Analysis Tool, *Pract. Dev. Health Care 8(1) 28 – 43, 2009*		

J:\PROJECT FILES - Ethics & Governance\Ethics\LNR\2014\LNR_14_SCHN_32\Approvals\LNR14SCHN32 Ethics Approval Letter 14 March 2014.docx

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APPENDIX 8 Consent form

Reducing risk for vulnerable children by engaging families in the medication safety agenda

Investigators:

Professor Wilson Valerie	UTS, SCHN	02 9845 3093
A/ Professor Beata Bajorek	UTS	02 9514 8301
Professor Doan Hoang	UTS	02 9514 7943
Albara Alomari	UTS	

I have read and understand the Information Sheet, and agree to participate in this research study.

The research team may contact me to participate in the following (please tick, you can select more than one):

1. Action Research Team ❑
2. Focus Groups which will be digitally taped ❑
3. Interviews which will be digitally taped ❑

I understand that I am free to withdraw from the study at any time and this decision will not otherwise affect my employment at the Hospital.

NAME OF STAFF: _____ (Please print)

NAME OF WITNESS: _____ (Please print)

SIGNATURE OF WITNESS: _____ Date: _____

APPENDIX 9 Permission from Comprehensive Child and Adolescent Nursing (CCAN)

Glasper E.A. <E.A.Glasper@soton.ac.uk>

Thu 12/21/2017, 7:07 PM

Yes, go ahead

Sent from my iPhone

Albara Alomari

E.A.Glasper@soton.ac.uk

Sent Items

Dear Glasper,

I have published a paper with title "Paediatric Nurses' Perceptions of Medication Safety and Medication Error: A Mixed Methods Study. " in CCAN, 2017. I would like to ask for a permission to include it in my PhD thesis.

Looking forward to hearing from you

Regards

Albara Alomari