Patient safety issues in intensive care units in Saudi Arabia. Health professional perspectives: a descriptive study.

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A research thesis submitted in partial fulfilment

of the requirements for the degree of

Master of Nursing

School of Nursing and Midwifery (Peninsula Campus)

Faculty of Medicine, Nursing and Health Sciences

Monash University

May 2016

Acknowledgments

I would like to show gratitude to my supervisors:

- **Kelli Innes**, my principal supervisor, for the continuous support of my master thesis and her patience, time, and immense knowledge.

- **Prof. Ruth Endacott**, my associate supervisor, for her insightful comments and encouragement, and for sharing her knowledge and time generously.

"***I could not have imagined having better supervisors for my master research***".

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Declaration

This thesis does not contain any material which has been accepted for the award of any other degree or diploma in any university and that, to the best of the candidate's knowledge and belief, the thesis contains no material previously published or written by another person except when due reference is made in the text of the thesis.

Signed: ___  _____

Date: 08/07/2016

List of abbreviations

AIMS-ICU	Australian Incident Monitoring Study-Intensive Care Unit
ANOVA	Analysis of Variance test
CAIR	Checklist for Assessing Institutional Resilience
CMAQ	Cockpit Management Attitudes Questionnaire
CN	Charge Nurse
CUSP	Comprehensive Unit-Based Safety Program
ENT	Ear, Nose and Throat
FMAQ	Flight Management Attitude Questionnaire
HFII	Health Foundation Inspiring Improvement
HN	Head Nurse
ICU	Intensive Care Unit
ICUMAQ	Intensive Care Unit Management Attitude Questionnaire
IOM	Institute of Medicine
IQR	Inter-Quartile Range
JCAHO	Joint Commission on Accreditation of Healthcare Organizations
JCI	Joint Commission International
KAACM	King Abdul-Aziz Medical City
KSA	Kingdom of Saudi Arabia
LOS	Length Of Stay
LPN	Licence Practice Nurse

LSD	Least Significant Difference
LVN	Licence Vocational Nurse
MERS-CoV	Middle East Respiratory Syndrome Coronavirus
MOH	Ministry of Health
MUHREC	Monash University Human Research Ethics Committee
NASA	National Aeronautics and Space Administration
NHMRC	National Health and Medical Research Council
NM	Nurse Manager
NSI	Nursing Staff Inexperience
RAAH	Rowaidat Al-Ardh Hospital
RT	Respiratory Therapist
SAQ	Safety Attitude Questionnaire
SAQ-ICU	Safety Attitude Questionnaire- ICU
SPSS	Statistical Package for Social Sciences
TeamSTEPPS	Team Strategies and Tools to Enhance Performance and Patient Safety
WADH	Wadi Al-Dawaser Hospital
WHO	World Health Organization

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Glossary of key terms

Sentinel event	any event that reaches a patient and results in any physical and psychological injuries leading to death or permanent harm (Joint Commission International [JCI], 2014).
Error	the wrong implementation of the intended plan or using wrong plans to accomplish certain objectives or goals (Kohn, Corrigan, & Donaldson, 2000).
Adverse event	(also called a harmful incident) harm or injuries caused by medical management rather than the underlying disease of the patient. (Kohn et al., 2000).
Patient safety incident	any events or actions that resulted or could have resulted in undesirable harm to the patients. Incidents can be reportable events, a near miss, or a no-harm incident (Kohn et al., 2000).
Reliability of instrument	is 'the consistency with which an instrument measures the construct of interest' (Gillespie & Chaboyer, 2013, p. 219).
Closed type ICU	means that any patient admitted to the ICU will be under the responsibilities of the intensivist including the patient treatment (Rye & Dorman, 2010).
Open type ICU	the physicians are responsible for managing the patient from hospital admission to discharge, including the ICU stay (Rye & Dorman, 2010).

Abstract

Statement of the problem: Critically ill patients in Intensive Care Units (ICUs) are faced with the challenge of surviving in a high-risk area and rely on healthcare professionals to ensure their safety and provide complex care. One way of measuring safety attitudes in the ICU is through self-reporting questionnaires.

Aim: To examine attitudes to patient safety in ICU from the perspective of healthcare professionals in the Kingdom of Saudi Arabia (KSA).

Method: A descriptive cross-sectional design was employed. The survey instrument - Safety Attitude Questionnaire (SAQ-ICU version) – comprised items regarding attitudes to patient safety, rating of communication and collaboration with colleagues, as well demographic questions.

Results: Sixty per cent (n= 144) of the healthcare professionals from two hospitals in Taif in KSA responded. Six safety domains were scored and showed that all participants had a negative attitude towards patient safety in the two ICUs, with one ICU scoring lower in all domains. Mean scores across domains ranged from 47.14 to 70.36 on a 100-point scale, with lowest scores for the 'perceptions of management' domain. Leaders and bedside nurses shared similar attitudes across domains. There was a significant difference in attitudes between respiratory therapists (RTs) and nurses ($F(2, 131) = 4.18$, $p = 0.017$); there were no other significant differences between groups. Whilst communication was mostly scored as adequate, physicians rated communication high with each other and with nurses ($t = 4.35$, $p = 0.000$).

Conclusion: The findings indicate that all domains need further attention. Differences between the two ICUs indicate that hospital safety culture may be an important issue for exploration in further studies.

1. Introduction

1.1 Background

Every day various advanced medical procedures, such as central venous catheter insertions, intubations, and complex medication administration, are carried out in the intensive care unit (ICU) (Harris et al., 2007). The ICU is a place where these interventions are provided to a patient in a potentially recoverable situation, who require special invasive procedures and close observation (Baruch & Messer, 2012). These patients may be admitted to the ICU with organ failure or with needs such as neurological support, advanced or basic respiratory support, circulatory support, renal support, trauma and post-operative management. The ICU is a different and complex environment compared to other units in a hospital due to the complexity of patient treatment that is required (Baruch & Messer, 2012). Therefore, as a consequence of the many interventions received, the possibility of medical errors in the ICU may increase (Harris et al., 2007).

There is no doubt that a critically ill patient would be unsafe if the facility was not able to deal with complex illnesses and injuries in a high and safe standard. In such situations, there would likely be a high mortality rate and an increased rate of medical errors (Moreno, Rhodes, & Donchin, 2009). Failure to provide quality care for patients in the United States of America led to 45,000 - 98,000 deaths yearly, mostly due to clinical errors (Moreno et al., 2009). Another study indicated that of 1,047 patients admitted to two ICUs and one surgical unit in the United State of America, around half of those patients had at least one adverse event, and 17.7% (n= 185) of those patients had a serious condition leading to either disability or death (Kohn et al., 2000). As such,

the health system should be designed to minimise the effect of errors rather than dealing with it as an incurable disease (Kohn et al., 2000).

However, since the 1990s, many healthcare organisations worldwide have investigated and explored patient safety issues in healthcare services (Pronovost, Wu, Dorman, & Morlock, 2002). An example of such an effort, 'To Err is Human', is a report published by the Institute of Medicine (IOM) describing patient safety in the United States of America (Pronovost et al., 2002). It highlighted many aspects of patient safety to alert healthcare organisations of the need for an improved healthcare system. The report stated that patient safety is a worldwide problem and patient safety and some injuries and illnesses (such as infections and anaphylaxis) are products of the healthcare system. Since the publication of this report, many healthcare services have initiated strategies to increase their staff's awareness of patient safety in an attempt to minimise the occurrence of adverse events (Pronovost et al., 2002).

The literature identified several elements of an unsafe ICU environment. The common characteristics of an unsafe facility were identified as lack of policy and guidelines, insufficient training, lack of or poor supervision, heavy workloads, and staff shortages (Bae, 2012). A study found that nurse understaffing and lack of training are associated with the occurrence of infections in the ICU (Daud-Gallotti et al., 2012). Working overloads and the increased rate of infection in ICUs are also seen as being interrelated (Storesund & McMurray, 2009). Storesund and McMurray concluded that over 50 per cent of registered nurses in some European countries are overloaded during their daily activities in the ICU, which resulted in poor patient care and a possible increase in infections. Indeed, adverse events and a poor work environment are associated with a negative impact on patient safety in ICUs (2009).

The literature suggests that acknowledging elements that prevent an individual from reporting an incident are highly important. The incidences reported by ICU nurses are an important factor in understanding and investigating how to overcome the failure to report errors (Ballangrud, Hedelin, & Hall-Lord, 2012). Elements such as cultural differences and communication barriers are some of the factors that could prevent an individual from reporting an incident (Ballangrud et al., 2012). Most often, nurses are uncomfortable or unaware of the need to report such incidences, and this may be attributed to poor policies in the hospital system (Henneman, 2007). The major issues of not reporting errors are due to communication and collaboration failure in ICUs (Henneman, 2007). The failure to recognise medical errors as a problem is a systematic failure within the organisation (Henneman, 2007). Strategies to report errors and increase patient safety, such as encouraging nurses and rewarding them for reporting incidences, would be helpful in delivering care in a safe manner (Ballangrud et al., 2012). Other reasons highlighted for healthcare professionals not reporting errors include lack of time, fear of punishment, lack of harm or injury to patients, an absence of manager responses and the complexity of reporting procedures (Espin, Wickson-Griffiths, Wilson, & Lingard, 2010). To overcome these issues, the implementation of routine round and hand-off reports can identify otherwise unreported errors and interrupt potential or occurring errors (Kohn et al., 2000; Valentin & Feddinande, 2011).

In 2016, the World Health Organization (WHO) announced that research into patient safety topics is a global priority. Therefore, this research is in line with WHO priorities (WHO, 2016a). Furthermore, due to limited research and adverse event reporting systems in Saudi ICUs, the need for conducting such a study is highly valuable. Moreover, the necessity of high standards management in Saudi Arabian ICUs to meet an approved level of patient safety is essential. Consequently, the current research study is required to identify issues (such as poor leadership

skills and knowledge) as well as increase the awareness of health professionals regarding the prioritisation of patient safety in the ICU.

1.2 Research aim

This study will examine attitudes to patient safety in ICUs from the perspective of healthcare professionals in KSA.

1.3 Significance of the study

The findings of this research may aid the hospitals involved in formulating or revising guidelines or policies that relate to patient safety in the ICU. In addition, the research findings may increase the awareness of healthcare professionals in both hospitals, and hence preserve patient's rights to safety while in the ICU. The result may be beneficial to local officials as well as healthcare leaders when formulating plans and strategies for providing a high level of patient safety in hospitals.

1.4 Thesis outline

This thesis comprises six chapters. In Chapter One the background and overview is presented. Chapter Two, the literature review, includes the history of the ICU, ICUs in Saudi Arabia, patient safety and adverse events in ICUs, an overview of patient safety in ICUs in Saudi Arabia, factors influencing patient safety, the healthcare professional's perspectives on patient safety, and instruments used to measure safety in ICUs.

In Chapter Three the research design is presented. Instrument development and structure, setting, ethical implications, the sample, data collection and data analysis are included in this chapter.

The results of the study are included in Chapter Four. In this chapter the response rate, characteristics of participants, and the responses to the 64 items including the analysis of the six domains are highlighted. As well as this, the scores for the quality of collaboration and communication among healthcare professionals, and the proposed recommendations by participants, are addressed.

Chapter Five focuses on a discussion of the study results. The findings of the six domains according to hospitals and job categories are presented. Also, findings related to collaboration and communication among healthcare professionals, and participants' recommendations to improve patient safety, are considered. A discussion on the limitations of the study and recommendations to improve patient safety is also addressed. The Final Chapter concludes the main findings of this study.

2. Literature Review

2.1 Introduction

The Intensive Care Unit (ICU) is one of the most complex and challenging areas for many healthcare professionals in the hospital. This is due to the complexity of patient conditions, the use of specialised medical equipment and the performance of multiple medical procedures by medical staff. These factors can contribute to an increase in adverse events and medical errors leading to poor patient outcomes (Harris et al., 2007). In addition, human error is believed to be more significant for critical care patients than other patients in general units, due to the many medications and complex procedures undertaken (Scott, Rogers, Hwang, & Zhang, 2006).

Patient safety in the ICU is considered an important challenge around the globe. However, the majority of studies in the area have focused on patient conditions, therapeutic interventions and the physiology of disease, rather than the process of patient care (Moreno et al., 2009). Factors that impact on patient outcome measures, such as differing cultural environments, the way staff practice, and healthcare professional skills and knowledge, have been identified as crucial issues (Moreno et al., 2009). Hence, the aim of this study is to examine attitude to patient safety in the ICU from the perspective of healthcare professionals. The purpose of the literature review is to identify and critique previous studies conducted in ICUs related to patient safety attitudes of healthcare professionals and methods of measurement.

2.2 Search strategy

In order to locate literature relevant to the study, the following online databases were used: PubMed, CINAHL Plus, Ovid, and Cochrane Library. The search terms and keywords included

"health care professional OR ICU nurse OR registered nurses OR physician OR respiratory therapist (RT) OR critical care staff OR practitioner OR intensivist and ICU clinician OR critical care team" AND "patient safety OR ICU patient safety OR critical care patient safety OR ICU client safety OR ICU consumer safety" AND "intensive care unit OR adult ICU OR Medical - Surgical ICU OR critical care unit" AND "patient safety issues OR ICU patient safety issues OR ICU client safety concerns OR adverse event in ICU OR ICU incidents OR ICU error OR safety climate issues OR safety attitude issues."

These terms were combined and narrowed to include full-text articles. The following inclusion criteria were applied: studies published in English in peer-reviewed journals; studies conducted in adult (over 18 years of age) ICUs. Studies were excluded if they were conducted in the neonatal or paediatric critical area and/or were irrelevant to the aims of the literature review. Duplicate articles were removed, after which the titles and abstracts of the remaining articles were analysed to determine their eligibility. Articles that did not meet the criteria were excluded from the list of relevant reading materials. Additional articles were located from the reference lists of the reviewed articles. The literature review is structured as follows:

- The history of intensive care unit;
- The ICU in Saudi Arabia;
- Patient safety and adverse events in ICUs;
- Patient safety in Saudi Arabian ICUs;
- Factors influencing patient safety in the ICU;
- The healthcare professionals' roles and perspectives on patient safety issues in the ICU;
- Measuring the safety climate.

2.3 Intensive Care Units (ICUs)

The ICU is challenging setting due to its comlpex environment and patient conditions. It is different from other units in the hospital, as healthcare professionals need highly developed practical skills and knowledge to deal with complex situations and very ill patients (Melles, Freudenthal, & de Ridder, 2012). The ICU environment, with its advanced technologies, complex structure and use of invasive procedures, needs to be managed by well-trained and qualified critical care team members (Melles et al., 2012). After a brief overview of the ICU, the history of ICU progress is explored further in the next section.

2.3.1 The history of the intensive care unit

Since 1970, there has been rapid development in intensive care medicine, including technologies, equipment, and drugs in many developed countries (Kelly, Fong, Hirsch, & Nolan, 2014). Ventilators in particular have shaped the way in which critical care patients have been managed for example, less medication is now used to sedate patients (Kelly et al., 2014). The most obvious and essential development in the ICU is in the area of the skills and qualifications needed by healthcare professional including nurses, the establishment of research centres, and the evolution of scoring systems such as Acute Physiology and Chronic Health Evaluation (APACHE) system (Kelly et al., 2014). APACHE is a scoring system that assesses disease severity on admission and anticipated outcome of ICU patients (Vincent & Moreno, 2010). These developments have improved healthcare quality and patient safety in ICUs in many countries (Kelly et al., 2014). The next section will explore and describe the evolution of ICUs in Saudi Arabia.

2.3.2 The ICU in Saudi Arabia

There has been limited literature describing aspects of critical care services in Saudi Arabia in the Ministry of Health (MOH), such as healthcare professionals' training and admission rates to ICUs (Al-Omari, Abdelwahed, & Alansari, 2015). The health statistics annual book of MOH (2013) in Saudi Arabia reported some of the services provided in ICUs. Of 268 government hospitals with over 38,900 beds, 3200 were ICU beds. There were also 136 private hospitals with over 14,000 beds, including 1021 ICU beds. The MOH recorded over 1,750,000 admissions in hospitals in one year. However, there are no published data regarding critical care admissions in Saudi Arabia (MOH, 2013). Moreover, the total number of healthcare professionals in Saudi Arabian ICUs is not published.

Intensive care units in Saudi Arabian hospitals have various structures and functions, depending on their locations and resources. To illustrate this, Arabi & Al Shimemeri (2006) describe different services in three different hospitals in the central region of Saudi Arabia: Rowaidat Al-Ardh Hospital (RAAH), Wadi Al-Dawaser Hospital (WADH) and King Abdualziz Medical City (KAMC) (see Appendix A). RAAH had a small ICU, limited resources, and the majority of its medical staff are not certified for critical care. Critically ill patients in RAAH who need critical care management were transferred to an advanced critical care facility. Secondary care hospitals such as WADH were well equipped with some basic and some advanced medical equipment. Some of their medical staff members were well trained to work in such areas under the supervision of the intensivist who led the team. Whilst this paper was published ten years ago, the context reflects provision of intensive care services in KSA in the present day.

Tertiary care hospitals such as KAMC had multiple specialities and are run by specialised critical care teams. These tertiary care hospitals provide care at a high standard and are equipped

with the most advanced technologies and equipment (Arabi & Al Shimemeri, 2006). Most of these large ICUs are a closed type and are run by intensivists certified by European and North American critical care boards (Arabi & Al Shimemeri, 2006). A closed type ICU is one where all patients admitted there, and their treatment, are under the responsibility of the intensivist in charge. By contrast, in an open unit, the physicians are responsible for managing the patient from hospital admission to discharge, including the ICU stay (Rye & Dorman, 2010). In the next section, patient safety and adverse events in the global and national level are discussed.

2.4 Patient safety and adverse events

It is important to understand what is meant by patient safety, when considering the healthcare professionals' roles and responsibilities in building up specific policies and regulations to maintain patient safety during hospitalisation. The Institute of Medicine defines patient safety as "the prevention of harm to patients" (Almutairi, Gardner, & McCarthy, 2013, p. 188). Another definition of patient safety proposed by the WHO is "the absence of preventable harm to [the] patient during the process of health care" (WHO, 2016b).

Patient safety can be maintained by eliminating, avoiding, or preventing any adverse events (Almutairi et al., 2013). Quality and safety in a healthcare facility should not be separated, as both are crucial elements in patient outcome. Human errors are seen as the most common cause of the increase in patient safety incidents (Ballangrud et al., 2012). As a consequence, these incidents are believed to have resulted from a combination of factors, such as a poor health system and cultural failure. Therefore, individual healthcare professionals should not be blamed in the first place for the occurrence of errors (Pronovost et al., 2002; Scott et al., 2006).

According to Scott et al. (2006), around 1.3 million patients worldwide per year are injured and over 100,000 deaths were attributed to adverse events in hospitals. An earlier report indicated that between 40,000 – 98,000 patients died annually in the United States of America from errors in healthcare facilities (Pronovost et al., 2002). The National Healthcare Quality Report of 2007 reported that between the years of 2000 to 2005 there was only 1% annual improvement in patient safety (Saladino, Pickett, Frush, Mall, & Champagne, 2013). Bassuni and Bayoumi (2015) added that patient safety in any organisation is a key indicator of a hospital's performance, which means the more errors that occur in the facility, the less reliable the services are. However, fewer errors indicate a high level of performance and standards in the hospital, provided robust reporting systems are in place

2.4.1 Patient safety in the ICU

It is recognised that, due to the complexity of the critical care area and the many procedures performed, the risk of adverse events in the ICU is higher than any other unit in hospital (Bassuni, & Bayoumi, 2015). Needham (2010) found that adverse events in ICUs are common, serious, complex and preventable; among 400 patients in one ICU, around 20% had an adverse event and 50% of these were preventable. Needham (2010) postulated that factors such as fatigue, stress, interruption and staff shortages among medical teams are some causes of increased human errors in ICUs leading to poor patient safety. Quality inter-professional relationships were also a key to a safe environment in ICUs (Needham, 2010). In another study, communication barriers and failures in interdisciplinary collaboration were also cited as important missing elements in regard to patient safety that could lead to sentinel events (Despins, 2009).

2.4.2 Patient safety in Saudi Arabian ICUs

The Saudi Arabian government is investing significantly in its healthcare system to improve quality and patient safety in all hospitals (MOH, 2013). Many programs related to patient safety and quality, such as using electronic files for each patient and strict infection control policies, have been supported by many government agencies, such as the MOH (Walston, Al-Omar, & Al-Mutari, 2010). These programs have been adopted by the MOH, the biggest healthcare provider in Saudi Arabia (with 60% of hospital beds), to obtain national and international accreditation, already obtained by many hospitals (Walston et al., 2010).

There are no official government figures regarding health professional errors in ICUs in Saudi Arabia, only few studies have been conducted in individual hospitals to assess and examine these issues. According to Aboshaiqah and Baker (2013), between 2001 and 2006, 25,000 medical errors were reported in Saudi Arabia, although the location of the errors were not reported and these data have not been ratified by government. A descriptive study in a tertiary care hospital in Saudi Arabia was conducted to examine the rate and categories of incident reports in all hospital units, including ICUs (Arabi et al., 2012). Over 3,000 incident reports were submitted from all hospital units, with over 60 incident reports from ICUs. The major categories of incidents in the ICUs were related to medication errors, communication problems, procedural variances and hazardous and safety incidents. The next section will examine what the literature demonstrates about factors that contribute to increase of patient safety issues in ICUs.

2.5 Factors influencing patient safety in the ICU

Factors contributing to poor patient safety in the ICU, such as staff burnout, lack of skills and knowledge, workload, stress, anxiety and staff shortages, have been highlighted in the literature. A study was conducted in one ICU in the south-eastern United States of America to evaluate the Comprehensive Unit-Based Safety Program (CUSP) (Saladino et al., 2013). The total population sample in the unit was 81 staff members. Half were nurses and the remainder were physicians, RTs, pharmacists and secretaries. The program consisted completing a module (video contents) and a safety attitude questionnaire-ICU version (SAQ-ICU). A total of 67 participants (83%) completed the module. The single-group repeated measures design was completed in a period of six months. The SAQs-ICU were also completed by 55 participants (69%).

To apply the program, the medical director of the ICU, the CUSP nurse champion and the unit nurse manager completed walk-rounds on a monthly basis for six months. By the end of the study, 77 safety issues were identified; only half of them were resolved during the study period. However, there were no statistically significant differences among the SAQ subscales, as all subscale scores fell within the "safe" range. Examples of the findings were that the unit size and design were not appropriate, particularly during emergency situations. Also, issues with medical equipment and communication with other departments were raised (Saladino et al., 2013).

A prospective cohort study conducted in an ICU in the United States of America which involved observing 332 patient with and without use of the checklist to determine the cause of losing critical information during the day (Stahl et al., 2009). As a consequence of poor communication between the healthcare team and lack of teamwork, critical patient information was lost (Stahl et al., 2009). A total of 75 patient care items over 24 hours such as laboratory orders and tests, were lost during the observation and study periods. There was a significant difference in

items lost with, 61/303 items (20.1%) lost during the observation period, and 14/386 items (3.6%) lost during the study period, (p= < 0.0001). Stahl and colleagues (2009) found that critical laboratory values and test results were the most commonly lost items during the control period (observational period). However, when a checklist was provided, there was a significant decrease in lost items, (p= 0.018) (Stahl et al., 2009).

Another prospective, single-centre study in three ICUs in urban teaching hospital in the United States of America was conducted to measure all patient safety events by using "a new card-based reporting system" (Harris et al., 2007). During a 14-month period, over 700 patient safety reports were registered. There was a significant increase in patient safety event reports when using a card-based reporting system (pre-intervention, rate ratio 0.50, vs intervention, rate ratio 2.05, p= < .001) and a statistically significant difference in terms of 'no harm reached patients' and 'events caused harm' (associated with harm, 74.1%, versus no harm, 84.3%, p= < .001). The most common types of events reported in the study involved interpretation of diagnostics tests, administrating respiratory treatment, inserting or removing central or urinary catheters and ordering errors (Harris et al., 2007).

The identified events reported in Harris et al (2007) were also mentioned in another study where long work hours were introduced to nurses. Scott et al. (2006) conducted a descriptive study in the United States of America to determine the association between nurses' work hours and patient safety. A random sample of 502 nurses was asked to work for over 16 hours. The total number of errors reported by all participants in the study, due to excessive work hours, were 224 errors and 350 near errors. The identified errors and near errors involved medication administration, charting and procedural mistakes. Those who worked over 12.5 hours are more likely to fall asleep than those who worked fewer hours (odds ratio= 1.5, p= .007). Therefore, it

is clear that working over 12.5 hours per shift or 40 hours per week is believed to be one of the major issues impacting patient safety, which leads to more errors (odds ratio= 1.46, p= .01) and near errors (odds ratio= 1.93, p= .001) (Scott et al., 2006).

A culturally diverse clinical workforce is a challenge for patient safety. Surveys and interviews were conducted to examine nurses' perceptions of clinical safety climates in a multicultural environment in healthcare facilities in Saudi Arabia. Out of 415 participants, 319 believed that their working environment was clinically unsafe (Almutairi et al., 2013). Cultural differences, language barriers or the clinical setting design could be responsible for such a negative attitude (Almutairi et al., 2013; Chaboyer et al., 2013). Following this discussion on patient safety in general and its associated factors, healthcare professionals' perspectives on patient safety in the ICU are considered next.

2.6 Healthcare professionals' roles and perspectives on patient safety issues in the ICU

The role of a critical care team in the ICU is essential as they have to deal with the most complex and challenging patients in the hospitals. Patients with severe illnesses and comorbidities require high and special care by well-trained healthcare members. For example, nurses play a pivotal role in coordinating most of the care in the ICU. They create an open communication channel between patients and other internal and external individuals (Brilli et al., 2001; Redden & Evans, 2014). Nurses have an important and powerful role in advocating and supporting patient and family needs of those under their care. They are responsible in maintaining patient safety, delivering a high standard of care, achieving appropriate infection control standards and

communicating with other healthcare team members about patients' conditions. Some of their many roles also include daily patient assessment, evaluation, administration of prescribed medications and routine bed care (Brilli et al., 2001; Redden & Evans, 2014).

However, RTs have a crucial role in the ICU in some countries, as they are primarily involved in assessing and treating patients with pulmonary disorders (Alotaibi, 2015). They work under the supervision and coordination of treating intensivist (Alotaibi, 2015). On the other hand, intensivists are often the team leaders in the ICU as they are responsible for completing a treatment care plan that the multi-professional team in the ICU is expected to follow and complete. As identified in section 2.3.2, in some ICUs comprehensive management is directed by intensivists in collaboration with the ICU nurse manager. Critical care physicians (certified as critical care specialist) should be available 24 hours a day to provide bedside care, particularly during the presence of emergency situations, although the data provided at Appendix A shows otherwise. However, in the ICU a multidisciplinary approach is an essential factor for maintaining a safe and high standard of care for critically ill patients. Different specialities in the ICU have been associated with improvements in patient outcomes, including quality of life and patient safety (Brilli et al., 2001). It has been suggested that qualifications and training in critical care are a mandatory requirement in achieving a higher standard performance in the ICU (Brilli et al., 2001; Valentin & Feddinande, 2011).

2.6.1 Nurses' perspectives

The perspectives of nurses towards patient safety in ICU are unique, as nurses provide the closest contact to ICU patients and are highlighted in this section. Ballangrud et al. (2012) conducted a cross-sectional study in 10 ICUs in six hospitals in Norway to explore nurses' perceptions of patient safety. A total of 220 nurses completed the provided questionnaires. The

result showed that around 50% (n= 108) of participants reported no incidents, while over 36% (n= 79) of nurses reported one to two incidents over the course of a year. Issues identified related to incident reporting, communication about errors, education needs and feedback.

The nursing skill mix and patient-staff ratio were identified as directly affecting patient safety. Different studies conducted in France, Brazil, the United States of America, and some other European countries found that issues such as skill mix and staff workloads could impact on the mortality rate and adverse events in ICU patients. In fact, major complications among ICU patients were due to excessive nursing workloads; therefore those patients who developed such complications were more likely to die (Pronovost et al., 2002; Robert et al., 2000; Tarnow-Mordi, Hau, Warden, & Shearer, 2000; West, Mays, Rafferty, Rowan, & Sanderson, 2009). Others found that nurses who cared for two to three patients in the ICU were more likely to increase further complications for their patients, such as pulmonary concerns (Pronovost et al., 2002; Rischbieth, 2006).

Penoyer (2010) in an annotated review, supported the idea that nurse staffing and patient outcomes and adverse events in ICU were interrelated. Penoyer (2010) found that a shortage of nurses and the occurrence of infections in the ICU are major problems that lead to poor patient outcomes However, when a higher level of registered nurse staffing in the ICU was observed, there was a reduction of 30% in the incidence of nosocomial pneumonia (odds ratio 0.7, 95% CI, 0.56-0.88) (Kane, Shamliyan, Mueller, Duval, & Wilt, 2007). Penoyer's interesting study in the critical care area stated that there was a relation between nurse staffing and mortality rate in the ICU (Penoyer, 2010). Postoperative complications, pathogen transmissions, bloodstream infections and other adverse events were increased in ICUs where nurse shortages and high workloads were present (Ferrer et al., 2014; Penoyer, 2010).

Some researchers have attempted to define the effect of nursing staff inexperience (NSI) on the occurrence of adverse events in ICUs. Morrison, Beckmann, Durie, Carless, and Gillies (2001) explored such a concept by gathering data from the Australian Incident Monitoring Study in the ICU (AIMS-ICU) and analysed the feedback by using descriptive methodology. A total of 735 incident reports were found to be related to the NSI. However, 94% (n= 688) of these incidents involved critical care patients and 49% (n= 360) of incidents were related to inadequate training. Indeed, NSI, staff shortage, lack of supervision and staff workloads were associated with the occurrence of errors among critical care members (Morrison et al., 2001). Similarly, Korean nurses believed that a lack of information sharing, inexperienced nurses and a lack of knowledge in the ICU negatively impacted patient safety (Choi, Choi, Bae, & Lee, 2011).

2.6.2 Physicians' perspectives

Physicians in the ICU had similar perspectives on patient safety as nurses. For example, a cross-sectional study in a Canadian ICU involved clinicians' and non-clinicians' perspectives of patient safety. A total of 136 participants completed the questionnaires, including 16 physicians. Three significant patient safety issues were identified, namely understaffing, poor bedside care for obese patients and medication errors (Kho et al., 2009). Another descriptive, multisite, cross-sectional study was conducted in 10 Australian ICUs. To measure the safety culture among 513 nurses, 89 physicians and 70 unknown professional groups, a Safety Attitude Questionnaire (SAQ-ICU) was used. There was a statistically significant difference between all sites for all scales which range from $p = < .001$ - .006, except the stress recognition subscale with $p = .09$. Some elements of patient safety were revealed by physicians, such as job dissatisfaction, a high stress level and poor working conditions (Chaboyer et al., 2013).

Physician workload in the ICU was associated with an increased mortality rate among patients. A multicentre longitudinal study in eight ICUs in France found that when the patient-to-physician ratio exceeded 14, the risk of death among patients increased by 3% (p= < .001) (Neuraz et al., 2015). An earlier systematic review by Pronovost et al. (2002) supported the hypothesis that physician staffing was associated with patient outcomes. Among 26 studies conducted in North America, Europe and Asia, 17 studies claimed that the ICU mortality rate ranged from 5% – 75% in ICUs that had intensivist shortages. However, it was observed that the mortality rate in the ICU dropped by 1% – 50% with a higher number of physicians. Another category indicated that 18 studies examined the relationship between a prolonged length of stay (LOS) in the ICU and physician staffing. When lower physician staffing was reported, the LOS in the ICU ranged from 2–14 days; however, that number dropped to 2–10 days when more intensivist staff members were present (Pronovost et al., 2002).

An unexpected and surprising finding related to patients who had been managed by a critical care physician, and acquired severe complications and died. In their retrospective analysis from a large database which consisted of 123 ICUs in 100 U.S. hospitals, Levy et al. (2008) found that patients who were managed by a critical care physician for their entire stay were more likely to experience more complications than patients managed by non-critical care physicians; therefore, those patients had a higher mortality rate. The authors attributed this to the fact that the ICU physician may use his or her own judgment rather than standardised published protocols. Also, some critical care physicians may use excessive or unnecessary procedures, such as a central venous catheter, which could lead to more complications. Early transfer to a normal ward before accomplishing a treatment plan by an intensivist or critical care physician may worsen the outcomes.

2.6.3 Respiratory therapists' perspectives

Respiratory therapists are part of a multidisciplinary team in ICU. However, no studies in the field of respiratory therapy and patient safety in the ICU have been found. Only one study stated that the lack of handover communication between nurses and RTs was addressed, as RT members met in their department by the end of the shift which was located outside the ICU (Saladino et al., 2013).

2.7 Measuring the safety climate

A few studies were conducted in Saudi Arabia, Iran and Greece to evaluate the nurses' attitudes to patient safety in the ICU by using the SAQ-ICU (Abdi, Delgoshaei, Ravaghi, Abbasi, & Heyrani, 2015; Alayed, Lööf, & Johansson, 2014; Raftopoulos & Pavlakis, 2013). A cross-sectional design study was conducted in Saudi Arabia to evaluate nurses' attitudes towards the safety culture in six ICUs (Alayed et al., 2014). Two-hundred and sixteen nurses completed the SAQ and six themes were identified, namely: staff ratio; nurses competency; ICU resources and guidelines; communication and collaboration skills; administration support and working contracts. Issues relating to these themes were identified as obstacles in maintaining patient safety in the ICU and further recommendations were advised in order to attain a safe environment. The authors concluded that the safety culture perception among nurses was low (Alayed et al., 2014).

Similar themes were found in one Iranian ICU using a mixed method study (Abdi et al., 2015). Forty-two nurses and physicians completed the SAQ-ICU and interview. The result showed that there were statistically significant differences among healthcare team members in a perceived teamwork climate (physicians (mean= 64.5, SD 7.3) and nurses (mean= 52.6, SD 13.4)), p= 0.001, and job satisfaction (physicians (mean= 78.2, SD 12.5) and nurses (mean= 57.7, SD 15.1)), p= <

0.001. The researchers stated that the results indicated the need for further attention in all domains (Abdi et al., 2015).

Moreover, Raftopoulos and Pavlakis (2013) utilised the same method and instruments used in the previously mentioned studies in five ICUs in Greece. Only 132 nurse participants completed the SAQ-ICU. The results revealed that nurses responded negatively to five domains, namely safety climate, perception of management, working condition, stress recognition and teamwork. Again, similar elements of patient safety concerns among critical care teams were mentioned, such as poor nursing skills, a lack of teamwork and a high stress level (Raftopoulos & Pavlakis, 2013).

2.8 Conclusion

It is evident that patient safety in ICUs is complex and difficult to deal with. Several interconnected factors such as staff shortages, high workloads, limited clinical skills and knowledge, a lack of a reporting system and poor communication and teamwork skills, could compromise patient safety. There are obviously differences between the perspectives of the physicians, RTs and nurses about patient safety in the ICU. Strategies such as adopting reliable reporting systems, improving staff-to-patient ratios, assessing clinicians' skills regularly and providing guidelines and policies based on evidence based practice, have been adopted by some countries to increase patient safety in the ICU. The literature shows that there has been a lack of research in the ICU sector in Saudi Arabia, particularly in the aspect of patient safety. However, limited studies have explored the issues in the general units within the hospital. Also, the literature identified a lack of adverse event reporting systems at the governmental level within Saudi Arabia to assess the severity of problems in ICUs. Moreover, there is limited knowledge about safety attitudes from the healthcare professional perspective, as in the case of RTs. Therefore, this study

will examine attitudes to patient safety in the ICU from the perspective of healthcare professionals in two hospitals in Saudi Arabia.

3. Research Design

3.1 Introduction

In this chapter the research design is presented, and the rationale for choice of method and data collection instruments is explained. The questionnaire structure and development is reported including the processes for establishing validity and reliability. The research setting and sample is presented, alongside the details of sample selection and the recruitment of participants. Further, the research's ethical considerations have been addressed. Finally, data collection and data analysis are presented and discussed.

3.2 Design

In order to examine attitudes to patient safety in the selected ICUs from the perspective of healthcare professionals in Saudi Arabia, a descriptive cross-sectional design was used. The main goal of a descriptive cross-sectional study is to examine or assess variables in real time without making any causal statement (Polit & Beck, 2010). Descriptive research design is used in non-experimental designs and, as such, is one of the easier to use quantitative methods (Polit & Beck, 2010). In this study, participants were requested to respond to issues related to patient safety in the ICU using an established safety attitude questionnaire. In quantitative research, to explore relationships between different variables, objective and systematic processes are adopted. This allows the researcher to keep at a distance from participants. Such detachment is beneficial to minimise any bias and involvement which might contaminate the findings and study outcomes (Topping, 2010). In descriptive design, variables are studied without the need for any modification

in their characteristics and conditions (Polit & Beck, 2010). For this study, healthcare professionals in ICUs were asked to report any issues related to patient safety utilising the self-administered questionnaire. Then these surveys were collected and analysed without imposing any internal or external modification on their original conditions.

However, the descriptive research method is sometimes described as weak due to its poor linkages between cause and effect, thus causal associations between variables cannot be determined (McKenna, Hasson, & Keeney, 2010). In general, a cross-sectional study is applicable for measuring the variables of interest in particular groups, such as nurses in an ICU, at a point in time (Kermode & Roberts, 2006; Polit & Beck, 2010). The reliability and validity of the instruments used is essential in generating consistent and accurate results. The use of valid and reliable instruments also encourages other researchers to replicate the study and use the results to compare and confirm the findings (McKenna et al., 2010).

The advantages of using a self-administered questionnaire are that data collection can be achieved in a short period of time and with minimal cost compared to an observational method. Thus, it is a convenient and time saving method for both participants and researchers. It also allows participants to analyse their thoughts before responding. Minimal or no bias is observed with a self-administered questionnaire, because it offers greater anonymity among participants (McKenna et al., 2010; Polit & Beck, 2010). The main limitations of self-administered questionnaires are: (i) the response rate may be low compared to other methods such as interviews, and (ii) participants may misinterpret the questionnaire items, therefore their answers may compromise the study findings (Polit & Beck, 2010). For this study, these limitations were addressed through meeting with a clinical instructor to clarify any issues with questionnaire items. Also, the email address of the researcher was supplied in the explanatory statement in order to

answer queries related to the questionnaires. To have an acceptable response rate, the questionnaires were distributed during a staff meeting, and it was collected after one month to provide opportunity for participation from those who were on vacation or leave.

3.3 Procedures

3.3.1 Instruments

The Safety Attitude Questionnaire (SAQ-ICU) (Appendix B) was used as a data collection instrument in this study. Permission to use this questionnaire was obtained from the University of Texas at Austin (Appendix C). The Safety Attitude Questionnaire tool (ICU Version [SAQ-ICU]) is one of several versions; all SAQ versions are derived from the same 'parent' version - the SAQ- and have similar content with slight modifications to fit the area under study, but without changing the meaning of items (Health Fundation Inspiring Improvement (HFII), 2011; Sexton et al., 2006). Much of the evidence regarding previous measurement of safety attitudes is related to the original SAQ; this is discussed in the section below.

The SAQ-ICU is easy to understand and complete. The SAQ-ICU is two pages long, takes approximately 10–15 minutes of the participant's time to complete (HFII, 2011) and is designed to measure knowledge or perceptions of safety (Osborne & Schneider, 2013). The SAQ has more benefits than any other safety climate or culture surveys such as safety climate surveys, safety climate tools and safety culture tools (HFII, 2011). First, there is a substantial amount of psychometric data available to compare the attitudes of healthcare professionals in different healthcare organisations and apply appropriate interventions if needed. Second, the SAQ has been used by highly-reliable industries such as those involved in commercial aviation, National

Aeronautics and Space Administration (NASA) and nuclear power. These industries are well known for their ability to deal with and manage high risk processes and mitigate errors (Sexton et al., 2006).

The SAQ is useful in comparing professionals' attitudes and perceptions to identify universal human factors across professions, such as in the case of ICU medical team and airline crew. Benchmarking data is available on the SAQ which allows healthcare organisations to evaluate their own safety attitude or climate data and compare it with previous findings (HFII, 2011; Sexton et al., 2006). One weakness of the questionnaire is that variation between staff attitudes cannot be explained and explored. For instance, the tool may identify differences in the perception of nurses and their managers without stating why such differences exist (HFII, 2011; Sexton et al., 2006). This is a common weakness with cross-sectional designs.

3.3.1.1 Development of questionnaire

The SAQ-ICU was developed by the University of Texas, Austin in 2000 (The University of Texas, 2015). The SAQ was derived from the Flight Management Attitude Questionnaire (FMAQ) and the Cockpit Management Attitudes Questionnaire (CMAQ) which have both been used widely in aviation industries (Sexton, 2002; Sexton et al., 2006). In the 1990s, the FMAQ was implemented for use in operating theatres. The operating theatre instrument version underwent several developments, based on feedback from experts and empirical analysis. In the late 1990s, an operating theatre survey was adapted for use in critical care units (ICUMAQs) (Sexton, 2002). Based on previous findings from CMAQ, FMAQ and ICUMAQ, the SAQ-ICU included the six domains which were adapted from aviation questionnaires after extensive review in the literature (Sexton, 2002). After further revisions, the SAQ-ICU items were designed according to the two conceptual models: Vincent's framework for analysing risk and safety (Vincent, Taylor-Adams,

& Stanhope, 1998) and Donabedian's model for assessing quality (Donabedian, 1988). In addition, several SAQ-ICU items were produced through discussions with healthcare members, and from subject matter experts and reviews of the literature (Sexton, 2002).

Thirty of the sixty four items were allocated under six domains as per previous studies, using the same items that were in the questionnaire (Abdi et al., 2015; Alayed et al., 2014; Chaboyer et al., 2013; Raftopoulos & Pavlakis, 2013; Sexton et al., 2006). Also, the distribution of items under each domain was instructed by the developer, The University of Texas, and according to the confirmatory factor analysis and fit model, to facilitate the analysis process (Sexton, 2002). The six safety domains including their definitions with examples for each are presented in Table 3-1.

Table 3-1 The SAQ domain and their definitions and example items

Domain	Definition	Example items
Safety Climate	"Perceptions of a strong and proactive organisational commitment to safety".	• I would feel perfectly safe being treated in this ICU. • Personnel frequently disregard rules or guidelines developed for our ICU.
Teamwork Climate	"Perceived quality of collaboration between team members".	• Disagreements in the ICU are appropriately resolved. • Our doctors and nurses work together as a well-coordinated team.
Stress Recognition	"Acknowledgement of how performance is influenced by stressors".	• I am less effective at work when fatigued. • When my workload becomes excessive, my performance is impaired.
Perceptions Of Management	"Approval of managerial action".	• Hospital management supports my daily efforts. • Hospital management is doing a good job.
Working Condition	"Perceived quality of the work environment, staffing and equipment".	• Our levels of staffing are sufficient to handle the number of patients. • The ICU equipment in our hospital is adequate.
Job Satisfaction	"Positivity about the work experience".	• I like my job. • This hospital is a good place to work.

Adapted from (Sexton et al., 2006).

The SAQ has been used in different countries around the world, including Australia, the United States of America, Cyprus and Sweden, to measure patient safety from the perspective of healthcare professionals (Chaboyer et al., 2013; Huang et al., 2007; Nordén-Hägg, Sexton, Kälvemark-Sporrong, Ring, & Kettis-Lindblad, 2010; Raftopoulos & Pavlakis, 2013). Higher scores on the SAQ across a range of settings have been correlated with patient outcomes characterised by fewer adverse outcomes, fewer medication errors, lower ventilator associated pneumonia and shorter ICU stays (Abdi et al., 2015; Alayed et al., 2014).

3.3.1.2 Questionnaire structure

The questionnaire is constructed in five sections (see Appendix B). The five sections are: job category and type of ICU experience, Likert scale items, rating the quality of collaboration and communication with other healthcare professionals, background information, and an open-ended question. These categories will be elaborated on further into this section.

In section one, the participants need to indicate their job as well as the type of ICU they work in. A Likert scale is then used to gather data in **section two**. Questionnaires may take a closed-ended or open-ended format. The Likert scale, with its closed-ended format, is one of the most common scaling methods used to measure the behaviours or characteristics of a person (Osborne & Schneider, 2013; Polit & Beck, 2010). The main idea of closed-ended questions is to compare the participant responses and facilitate analysis (Polit & Beck, 2010). Likert scales are usually constructed as four, five, seven, or 10-point scales (Osborne & Schneider, 2013). In this case, section two consists of 64 items with a 5-point statement: (1) disagree strongly; (2) disagree slightly; (3) neutral; (4) agree slightly; and (5) agree strongly.

There are several limitations with Likert scales including people tending to agree or disagree with the statements without considering the real meaning of the content, which could lead

to bias (Osborne & Schneider, 2013). Another limitation is that participants will sometimes feel forced to select an answer that does not represent their opinion (Nagy, Mills, Waters, & Birks, 2010). Likert scales assume that attitude can be measured. However, there should be no expectation that the differences between strongly disagree and disagree are equal to those between strongly agree and agree (Jones & Rattary, 2010). There is debate about whether a neutral point should be added or not. There is the possibility of bias and misinterpretation during data analysis with a neutral point. The advantages of the Likert scale are that it is easy and short, with simple and clear language; it is easy for the researcher to analyse and compare all data in a timely manner (Jones & Rattary, 2010; Nagy et al., 2010; Polit & Beck, 2010).

The quality of collaboration and communication among staff members is considered in **section three**. Participants, such as nurses, charge nurses, and intensivists, were required to rate their experiences in the 'quality of collaboration and communication' with other staff members in their clinical area. They are encouraged to choose one point from the six-point Likert scale: (1) very low; (2) low; (3) adequate; (4) high; (5) very high; and (6) not applicable. This is an important section and is related to the study aim where staff are asked to identify common safety issues in the ICU.

Section four asks participants to provide demographic information. The SAQ-ICU also asks the physicians to estimate the average monthly admissions made by them into the ICU. Demographic information helps researchers understand participants' backgrounds and relate them to different variables (Jones & Rattary, 2010). For instance, the researcher may want to compare the 'years of experience' to the safety or stress recognition domains in the survey to determine if there is any association between the two variables.

Section five invites participants to answer an open-ended question: 'What are your top three recommendations for improving patient safety in this ICU?' Open-ended questions allow participants more freedom to express their opinions through their own words without imposing a fixed statement on them (Nagy et al., 2010). This technique in identifying alternative responses by the participants is helpful to the researcher in facilitating the analysis and closing any identified gaps (Nagy et al., 2010). However, open-ended items can result in an item being left blank if participants are not prepared to provide a response, and responses can be time consuming and difficult to analyse (Nagy et al., 2010; Osborne & Schneider, 2013).

3.3.1.3 Reliability and validity

Reliability is "the consistency with which an instrument measures the construct of interest" (Gillespie & Chaboyer, 2013, p. 219), while validity is" the degree to which an instrument measures what it is supposed to measure" (Polit & Beck, 2010, p. 377). As mentioned before, the reliability and validity of the SAQ-ICU has been established. Six cross-sectional surveys of healthcare professionals in 203 clinical areas including ICUs in the United Kingdom, the United States of America and New Zealand were utilised (Sexton et al., 2006). The SAQ-ICU has been used to establish a benchmark among organisations to test the questionnaire's reliability and validity. The results indicate that the SAQ-ICU used in the study scaled a Cronbach's alpha of 0.9 (Sexton et al., 2006). This is a reliability coefficient and constitutes the most widely used method of testing the internal consistency of an instrument, particularly the Likert-scale response format. In Cronbach's method a reliability coefficient of 0.70 or above is acceptable, although a value of over 0.80 is more desirable (Jirojwong, Johnson, & Welch, 2011).

Convergent validity was also established in different studies (Sexton et al., 2006). Convergent validity represents the "degree to which two constructs are expected to be related"

(Gillespie & Chaboyer, 2013, p. 226). For instance, the climate scores from the SAQ-ICU were correlated with the scores of the Checklist for Assessing Institutional Resilience (CAIR) tool. The CAIR was developed to measure the patient safety climate among managers in hospital units; an independent evaluation of the SAQ-ICU using the CAIR tool produced the anticipated convergent results (Sexton et al., 2006). Convergent validity was confirmed also in other ways. When analysing the open-ended question responses in the SAQ-ICU, such as, 'What are your top three recommendations for improving patient safety in this ICU?' the responses were linked to the SAQ-ICU factor scores. To illustrate, the ICU staff that rated the stress recognition domain higher were more likely to make recommendations regarding the need for improved staffing levels (Sexton et al., 2006).

To validate the questionnaire items including the fit of the six domains in the questionnaire, exploratory analyses, confirmatory factor analysis, model fit, and pilot studies were carried out in four ICUs in the United States of America and one ICU in the United Kingdom (Sexton et al., 2006). Then six domains that affected the critical care staff's attitude were identified as seen in Table 3-1.

3.4 Setting

The study was conducted in two major teaching hospitals in Taif, KSA. The first hospital (Hospital A) has a 500-bed capacity with a 27-bed ICU. Hospital A is a public hospital and accepts all patients with or without referrals (A. Kri, personal communication, April 22, 2015). The hospital serves a population of over one million people in all Taif regions including rural areas (Ministry of Health, 2013). Hospital A is the main centre for Corona patients in the city. Corona

patients are those who were infected with Middle East Respiratory Syndrome Coronavirus (MERS-CoV) (A. Kri, personal communication, April 22, 2015). Infected patients may show clinical symptoms of severe acute respiratory illness including cough, fever and shortness of breath. There is no treatment so far and many deaths have been reported. Patients exposed to MERS-CoV are admitted into this facility for isolation precautions (Centers for Disease Control and Prevention, 2015).

In terms of human resources in the ICU, currently there is an estimated 142 healthcare members working in Hospital A (nurses= 110; physicians= 20; RTs= 12) (A. Kri, personal communication, April 22, 2015). The ICU design in Hospital A consists of four nursing stations with each station connected to seven rooms (A. Kri, personal communication, April 22, 2015). The rooms are single design, with each room equipped with all medical and non-medical equipment for one patient only. All rooms are separated by clear glass including electronic doors. There are also two isolation rooms with negative pressure. All cardiac monitors in the rooms are connected to central cardiac monitors located in every station (A. Kri, personal communication, April 22, 2015).

The second hospital (Hospital B) is a public hospital with a 500-bed capacity and a 22-bed ICU. Hospital B is a specialised hospital, accepting only emergency cases involved in car accidents or natural disasters when no beds are available in Hospital A. Hospital B also accepts referrals from other hospitals and services such as the Children Hospital, Mental Health Services and all peripheral hospitals in Taif. Services that are not available in these healthcare facilities such as plastic surgery, thoracic surgery, oral and maxillofacial surgery, and all surgical procedures of paediatric patients are referred to Hospital B. Approximately 107 healthcare professionals work in the Hospital B ICU (nurses= 81; physicians= 18; RT= 8). The ICU in Hospital B is designed with

both single and double rooms, with two patients in the same room. Two negative pressure isolation rooms are also available. One nursing station is located in the centre of the unit (A. Kri, personal communication, April 22, 2015).

Both hospitals are government hospitals and operate under the umbrella of the Ministry of Health. These hospitals offer free services for all Saudi Arabian citizens and emergency services for overseas citizens. Both are teaching hospitals registered by the Saudi Commission for Health Specialities. General medical and surgical services are offered in both hospitals as well as speciality services such as a coronary care, a day surgery unit, operating rooms, and ear, nose, and throat, urology, ophthalmology, and kidney dialysis centres. Both ICUs admit adults, which may have medical and/or surgical needs, and are of the closed type, which means that any patient admitted to the ICU and their treatment will be under the responsibility of the intensivist (Al-Omari et al., 2015).

The ICUs can provide immediate resuscitation and short- and long-term cardiorespiratory support. Patients with a multi-system dysfunction can be managed in these particular facilities. The patient to staff ratio in the two ICUs varies. The nurse to patient ratio is one nurse to 2 patients (1:2), sometimes when a shortage of staff is experienced the ratio increases to 1:3. Patients in isolation must be nursed with a 1:1 ratio. Critical care physician (resident) to patient ratio is 1:7 or 1:8 depending on the physician staffing. There was at least one intensivist (consultant) for the whole ICU in each facility. Qualified critical care physician specialists are available 24 hours. Thus, the total ICU bed capacity in both ICUs is 49 with 249 healthcare professionals. However, the number of team members is not fixed due to non-renewable contracts, resignations, and staff relocation (A. Kri, personal communication, April 22, 2015).

3.5 Ethical implications

Ethical approval from the two hospital ethics committees was granted; anonymised approval letters are attached in Appendices D and E (with the originals having been viewed by the supervisors of this research project). Also, ethical approval from the Monash University Human Research Ethics Committee (MUHREC) was obtained (Project Number: CF15/3671 – 2015001592) (Appendix F). All aspects of ethical issues during the entire process were complied with, according to the Australian National Statement on Ethical Conduct in Human Research 2007. (National Health and Medical Research Council (NHMRC), 2015). To ensure the rights of the research participants were protected and respected during all research stages, the researcher addresses and considers the following three core principles during the study period: justice, non-maleficence and beneficence; privacy, anonymity and confidentiality; and autonomy and consent (Woods & Scheider, 2013).

3.5.1 Justice, Beneficence and Non-maleficence

In general, justice is the right to fair and equal treatment; when applied to research, justice means that benefits and risks should be distributed equally and fairly among participants (Woods & Scheider, 2013). In the study, all healthcare professionals in ICUs had the right to participate except for those who did not meet the inclusion criteria. According to Woods and Scheider (2013) participants should be selected in the study because they meet specific and clear inclusion criteria, not because of the participant availability or any other factors. Regarding actual participation, the study involved submission of an anonymous questionnaire. This meant that it was not possible to withdraw any submitted responses as the questionnaires had no identifiable coding. Another essential aspect of the ethical principle of justice is that the researcher must be available to answer any questions and clarify any issues raised by participants at any time. The explanatory statement

(Appendix G) provided contact details of the researcher for the purpose of clarification, comments or complaints (Woods & Scheider, 2013).

Beneficence is ensuring that the benefits of the research outweigh the harms (Polit & Beck, 2010). Current studies can bring more benefits than harm to participants and their patients, as well as their facilities. One benefit of the research was to increase the healthcare team's awareness of common patient safety issues, which may benefit patients and their families.

Non-maleficence ensures that no or minimal harm is imposed on participants at any time during the study. All risks and benefits should be addressed during the proposal process to help the Ethics Committee determine the appropriateness of the proposed study (Nagy et al., 2010). As the study only imposed a minimal risk of discomfort on participants, the researcher submitted a low-risk application to MUHREC.

3.5.2 Privacy, Anonymity and Confidentiality

Maintaining privacy is ensuring that all matters, including the personal information of participants, are dealt with in a confidential manner (Woods & Scheider, 2013). In research, preserving privacy involves maintaining the participants' anonymity at all stages, even during the publication of results. One issue considered carefully during this study was that the researcher was a member of the ICU team where data was collected. Any involvement with participants may enable the researcher to exercise any undue influence or expose the identity of participants. So, to overcome such issues a member of the education department in the hospital was asked to distribute the questionnaires without any involvement by the researcher. This strategy ensured that participants' privacy would not be compromised, particularly on those who had no intention to participate (Woods & Scheider, 2013).

Anonymity means that no one, including the researcher, can identify any participants and their completed questionnaires (Johnson & Long, 2010). During the data collection stage, every participant was asked to complete the SAQ-ICU and enclose it in the envelope provided to protect their privacy. To protect the participants' anonymity, no identifying data such as name was collected. Anonymity of the hospital was not assured as when publishing the findings, as the researcher will identify himself as a staff member of the hospital A where the study was conducted. However, the use of two hospitals for data collection means that is not possible to attribute particular results to an identified hospital.

The participants were assured that their collected and analysed data would be treated as strictly confidential, and therefore all data were stored securely in a personal computer with a password (Johnson & Long, 2010). All completed questionnaires were stored in a safe and secure locked cabinet in a secure facility at Monash University. According to Monash University guidelines, after five years if no longer required, all data will be destroyed in a shredder then placed in secure waste areas. Only the researcher and the researcher's supervisor (if applicable) have access to the data (NHMRC, 2015). According to Burns (2011) a breach of confidentiality can be caused by certain actions of the researcher, either direct or non-direct. Allowing unauthorised persons to review the collected data and reporting, or publishing documents identifying participants' names, are just a couple of examples of breaching confidentiality. The researcher is responsible for ensuring that all ethical issues such as maintaining privacy, confidentiality and anonymity of participants at all stages of the study, are considered carefully (Nagy et al., 2010).

3.5.3 Autonomy and Consent

Allowing participants to exercise their autonomy is ensuring that a participant has the freedom to make his/her decision to either participate in the study or not. Autonomy can be

expressed by a person when there is no internal or external restraint or coercion involved when making a decision (Woods & Scheider, 2013). To ensure voluntary participation in the study, the researcher instructed the ICU nurse managers to place the provided boxes in the staff common room, to ensure participants could return the completed questionnaires anonymously. Such a strategy prevented the researcher, due to limited involvement with the participants and the anonymity of the questionnaires, from imposing any coercion on those who chose not to participate (Woods & Scheider, 2013). Further, to prevent ICU nurse managers from forcing staff to participate, a member of the education department in the hospital distributed the questionnaires.

The participation in the study was voluntary, therefore returning the completed questionnaire was considered implied consent to participate. According to Polit and Beck (2010), researchers should assume implied consent when questionnaire is used as the main method of data collection. All relevant information such as the aim of the study and other details was provided for every participant in simple and understandable language.

3.6 The sample

In this study, convenience sampling was used to select participants from Hospital A and Hospital B. Convenience sampling is a form of non-probability sampling, which is used by researchers to select the most readily accessible and willing healthcare professionals as study participants (Polit & Beck, 2010). The main advantage of using convenience samples is that researchers can easily recruit participants. Usually studies require participants who can meet only the set inclusion criteria, therefore obtaining an acceptable number of participants can be challenging. A concern with convenience sampling, however, is the high risk of bias. Convenience sampling tends to be self-selected, therefore the collected questionnaires come only from those who choose to participate (Polit & Beck, 2010). Thus there may be a high possibility of bias, with questions being raised as to why some potential participants chose to participate while other chose not to (Polit & Beck, 2010).

3.6.1 Sample selection

The inclusion criteria for the study were ICU nurses, physicians and RTs in the ICU of Hospital A and Hospital B with a minimum of three months experience working in the ICU. Participants had to be able to read and understand English. Exclusion criteria were non-English speaking or healthcare professionals with less than 3 months experience, as those new healthcare professionals are in their probationary period and are not allowed to deal with patients without supervision. Their inclusion in the study would have compromised the study findings due to their limited knowledge of the ICU environment and patient safety. Thus, prior to undertaking the study, it was determined that 240 ICU staff from Hospital A and Hospital B were eligible to participate. It is acknowledged that exclusion of non-English speaking nurses may introduce bias; however,

there was no scope in the timetable for the study to validate the SAQ-ICU for an Arabic-speaking population.

3.6.2 Recruitment of participants

Data collection took place throughout November and December 2015 at Hospital A and Hospital B. Four weeks prior to the study, the researcher conducted a meeting with the ICU nurse managers, the heads of ICU and a respiratory therapist, and a member from the education department of each hospital, to explain the study procedure. A questionnaire package including an explanatory statement and a copy of ethical approval from the university and hospital was given to the ICU nurse managers. The ICU nurse managers posted an announcement on the "unit announcement board" to invite staff to join the study. The researcher advised all managers that the distribution of questionnaires should be done by a member of the education department to prevent coercion or bias.

3.7 Data collection

A member of the education department of each hospital, which will be referred to as a clinical instructor (CI), organised a meeting with all eligible ICU staff members. The day and time of the meeting was discussed and organised with all managers in the unit. CIs in both units distributed a questionnaire package to each participant including an explanatory statement and a copy of ethical approvals. Questions and clarifications were answered and discussed by CIs and nurse managers without any involvement of the researcher. The CIs placed the provided box in the staff common room, and participants were instructed to return their anonymously completed questionnaire in the box. The participants were given the choice to place their questionnaires in a provided sealed envelope if they wished. CIs also advised all participants to keep the explanatory statement form for future reference. After two weeks, a reminder call from the researcher to both

ICU nurse managers was made to improve the response rate. ICU nurse managers posted another reminder to staff, and an email by ICU nurse managers was sent to participants to encourage them to complete the questionnaires. After five weeks, the questionnaires were collected by the researcher and securely stored.

3.8 Data analysis

After the questionnaires were returned, the researcher reviewed all questionnaires for completeness and accuracy. The questionnaires were coded with an identifying number for analysis. Then, all data items were entered into the Statistical Package for Social Sciences (IBM SPSS-ver23) for analysis. Entered data was then visually checked for any errors or inconsistencies. The paper-based questionnaires were reviewed again to correct any errors with data entry. A total of 103 variables were created for data analysis.

Preliminary analysis of data was carried out by calculating descriptive statistics for nominal and ordinal data items. Descriptive statistics allow researchers to organise, describe and summarise raw data, enables researchers to easily observe any differences and allow large and complex numerical data to be reduced to meaningful and simple units (Fisher & Scheider, 2013). Some of the common descriptive statistics used in this study are median, interquartile range (IQR), mean, frequency, range and standard deviation.

The median and IQR were utilised for variables that did not have a normal distribution, such as years of experience in the speciality area and the average number of patients admitted by physicians (Pallant, 2013; Polit & Beck, 2010). The mean and SD were used with data that was normally distributed, such as the 64-items and the quality of communication and collaboration section (Fisher & Scheider, 2013). Frequency was used to organise and summarise the occurrence

of data. Frequency and percentages were used with some demographic information such as nationality, ethnic groups, ICU job category and usual shifts of participants (Fisher & Scheider, 2013).

The chi-square (x^2) test was used to examine associations between categorical variables such as between participants in the two ICUs who scored positively (>75) (Fisher & Scheider, 2013). As the data were normally distributed, the difference in the main scores of the six domains between nurses and other professionals (physicians), and between bedside nurses and nurse leaders, were tested by independent sample *t*-tests (Fisher & Scheider, 2013). However, with the third group of participants (respiratory therapists), the relationships between all three groups were tested by the analysis of variance [ANOVA].

One-way between-groups ANOVA is considered when there is one independent variable with more than two groups (nurses, physicians and RTs) and one dependent continuous variable (such as the teamwork climate domain of the SAQ-ICU) (Pallant, 2013). The ANOVA test shows the significant differences in the mean scores on the dependent variable (teamwork climate) across all groups. Then a post-hoc test can be adopted to recognise where the differences lie (Pallant, 2013). To find out if there was any linear correlation between selected independent variables such as age and years of experience and between all domains, the Pearson (r) Correlation Coefficient test was used. Correlations are used to explore if any relationships exist between variables (Fisher & Scheider, 2013). *P* values <0.05 were considered statistically significant. The open-ended question responses were analysed using qualitative content analysis, and themes were identified from the responses (Polit & Beck, 2010). Content analysis involves the analysis of the content of narrative data to extract themes and sub-themes (Polit & Beck, 2010).

For easy and accurate analysis, and in line with other uses of the SAQ-ICU, the Likert scale was converted to a 0-100 scale: (0) disagree strongly; (25) disagree slightly; (50) neutral; (75) agree slightly; (100) agree strongly, where a score greater than 75 is identified as a positive attitude towards patient safety. For example, the working condition domain is composed of 5 items; however, if a participant answered Neutral, Agree Slightly, Disagree Slightly, Agree Slightly and Neutral, then this person's working condition score would be (50+75+25+75+50)/5= 55. This would not count as a positive score. Therefore, the participant must agree slightly or score higher to all related items under the domains to get a positive score (Abdi et al., 2015; Alayed et al., 2014; Sexton et al., 2006).

All 64 items were analysed. However, only 30 items were allocated under one of the six domains, as discussed in section 3.3.1, as following: safety climate (7 items), teamwork climate (6 items), stress recognition (4 items), perception of management (4 items), working condition (4 items) and job satisfaction (5 items) (Sexton et al., 2006). Also, before analysis, two negatively worded items were reversed in the SPSS data file. The inclusion of "negatively worded" is important in reducing response bias in the questionnaire (Pallant, 2013). For this questionnaire, these items are number 12 ("In this ICU, it is difficult to discuss errors") and 26 ("In this ICU, it is difficult to speak up if I perceive a problem with patient care"). Finally, to calculate the 30 items scores (domain scale) for an individual respondent, the following steps were followed (The University of Texas, 2012):

1. Reverse score all negatively worded items (items 12 and 26).
2. Calculate the mean of the set of items from the scale.
3. Subtract 1 from the mean.
4. Multiply the result by 25.

3.9 Conclusion

This chapter has described the research design. The instrument used in the study including its development, reliability and validity and the questionnaire structure, was discussed. The two settings where the study was conducted have been introduced. All ethical implications during the study period were addressed. In this chapter sampling, the sampling criteria and the recruitment process were explained. Finally, data collection and data analysis were established and discussed. In the next chapter, the result findings will be presented.

4. Results

4.1 Introduction

In this chapter, the results of the study are presented in five major sections, commencing with the response rate of participants. Next, the characteristics of participants are described. In the third section, the safety attitude questionnaire results are presented. The responses to the 64 items and the attitude of healthcare professionals to patient safety in the two ICUs towards the six domains are summarised in section three. In the fourth section, the quality of collaboration and communication experienced with different healthcare professionals is examined. In the last section, participants' recommendations for improving patient safety in the ICU are highlighted.

4.2 Response rate

A total of 240 questionnaires were distributed in ICUs at Hospital A (n= 148) and Hospital B (n= 92). One hundred and forty nine questionnaires (a 62% response rate) were returned from both ICUs. However, only 144 questionnaires (a 60% response rate) were eligible for the study: 106 from nurses (60%), 15 from RTs (65%), and 23 from physicians (56%). From Hospital A the response rate was 63.5% (n= 94), while in Hospital B the response rate was 54.3% (n= 50). The five excluded questionnaires were incomplete or did not meet the inclusion criteria.

4.3 Characteristics of participants

The sample were healthcare professionals in ICUs from Hospital A and Hospital B with different demographic information. The mean age of participants was 29.5 years (SD 6.39). The largest proportion of participants were aged between 25-29 years (n= 83, 57.6%). Participants aged between 30-34 years (n= 24, 16.7%) were the second largest group, while the rest of participants

were either under the age of 25 years (n= 12, 8.3%) or above 35 years (n= 21, 14.6%). Four participants (2.8%) did not provide their age.

The majority of participants were female (n= 118, 81.9%). The largest number were of Asian (n= 101, 70%) and Middle Eastern (n= 43, 23.7%) nationality. The number of participants who identified themselves from African, White and Black ethnicity groups were considerably lower (2.8% (n= 4), 2.1% (n= 3) and 0.7% (n= 1)) respectively, only (n= 5, 3.5%) participants identified as Sudanese national.

Most participants were critical care Registered Nurses (RN) (n= 96, 66.7%), followed by medical residents (n= 16, 11.1%), RT (n= 15, 10.4%), intensivist (n= 7, 4.95%), charge nurses (CN) (n= 6, 4.2%) and nurse manager/head nurse (NM/HN) (n= 4, 2.8%). All participants identified the ICUs as being mixed medical/surgical. For the purpose of simplifying the analysis, those nurses who ticked the choices in the SAQ-ICU, "CN" and "NM/HN" were categorised as leaders. Critical care registered nurses were included in the analysis as bedside nurses.

In regard to the year of experience in the specialty of participants, it was recorded that the median was 3.0 years (n= 144, IQR: 1.75, 7). While, work experience in ICUs, the median was 2.0 years (n= 144, IQR: 1, 4). With regard to the usual shift of participants, the results showed that the majority of participants had variable shifts (n= 118, 81.9%), while 21 (14.6%) of participants worked only day shifts. Participants who were working evening and night shift accounted for 1.4% (n= 4). The missing data from this category was 0.7% (n= 1). The average number of patient admitted to ICUs each month by physicians was 23 (median 60, IQR: 40, 70).

In response to question 65, "Have you completed this survey before", 140 (97.2%) participants answered "no", while 3 (2.1%) of participants answered "yes". One participant (0.7%)

did not know if he/she completed such questionnaires before. Table 4-1 described the response rate of participants to the 64 items according to job category. There was no significant difference between the two hospitals regarding the response rate to the 64 items based on professional groups, x^2 (df= 5, n= 144) = 2.98, p= 0.7. In the next section, the outcome of the safety attitude questionnaires including the six domains will be explored.

Table 4-1 Response rate to the 64 items according to job category by hospital

Hospital / Job category	Hospital A		Hospital B	
	Frequency (n= 94)	**Percent (%)**	**Frequency (n= 50)**	**Percent (%)**
CN	3	75.0	2	100.0
NM/HN	2	66.7	1	100.0
Nurse	61	91.0	29	100.0
Intensivist	1	50.0	3	66.7
Resident	8	75.0	4	87.5
RT	7	87.5	7	100.0
Total	**82**	**77.1**	**46**	**92**

4.4 Safety attitude questionnaire (SAQ-ICU) results

The 64 items in the SAQ-ICU were analysed, with a highlight on the 30 items allocated to the six domains. Further, participants' attitudes to patient safety in both ICUs have been presented. The full table of results is at Appendix H; in this study the results are presented for the six domains. The reliability coefficient of the SAQ-ICU in this study was 0.78, which is acceptable value.

4.4.1 The participants' attitudes to the SAQ-ICU

As shown in Appendix H, 99.7% of items were answered, with a 0.3% of missing data. Of the total number of participants (n= 144), 53.5% (n= 77) responded to the questionnaire items positively (>75), which means participants rated different items with scores of 75 or 100. In

general, participants in the two ICUs rated their attitudes to patient safety negatively (mean= 60.79, SD 7.26). To clearly identify the attitude of participants to patient safety, the 30 items from the questionnaires which were allocated under six domains are described next.

4.4.2 Healthcare professional attitude according to the six domains in the two ICUs

A total of 144 participants from Hospitals A and B responded to the 30 items allocated under six domains with a 0.1% of missing data. As discussed previously, a domain score > 75 is considered as a positive attitude towards patient safety. However, as seen in Table 4-2, neither of the ICUs achieved a mean >75 in any of the six domains. The total mean of safety attitude questionnaires according to six domains was 61.23 (SD 7.30) which indicated that participants in both ICUs had a negative attitude towards patient safety. Overall, Hospital A participants rated the safety climate teamwork climate, stress recognition and job satisfaction domains higher, while Hospital B participants rated the perception of management and working condition domains higher. The mean scores of both ICUs according to each domain have been elaborated next.

Table 4-2 Total scores of the six domains in Hospital A and Hospital B

Domains	Mean ± SD		
	Total sample (n=144)	**Hospital A (n=94)**	**Hospital B (n=50)**
Safety Climate	60.66 ± 02.67	61.25 ± 13.20	59.57 ± 11.67
Teamwork Climate	64.91 ± 13.00	66.59 ± 12.53	61.75 ± 13.41
Stress Recognition	60.76 ± 24.17	66.82 ± 23.72	49.38 ± 20.83
Perceptions of Management	47.14 ± 19.00	44.68 ± 19.10	51.75 ± 18.12
Working Condition	58.55 ± 18.62	58.05 ± 18.37	59.50 ± 19.24
Job Satisfaction	70.36 ± 14.94	73.38 ± 13.50	64.70 ± 15.99
Total	**61.23 ± 07.30**	**62.55± 06.78**	**58.75± 07.66**

Safety climate domain items were rated negatively by all participants, with a mean of 60.66 (SD 12.67) (see Table 4-3). Almost half the participants (n= 72, 49.9%) positively rated (>75) the seven items allocated under safety climate domain. Hospital A participants scored the domain (mean= 61.25, SD 13.20) higher than Hospital B participants (mean= 59.57, SD 11.67). No single item from the safety climate domain was rated >75 by all participants.

Table 4-3 Safety climate domain items

SAFETY CLIMATE		**Total Sample (n= 144)**	**Hospital A (n= 94)**	**Hospital B (n= 50)**	**% +ve responses (>75)**
		Mean (SD)	**Mean (SD)**	**Mean (SD)**	
4	I would feel safe being treated here as a patient.	63.72 (24.53)	64.63 (24.15)	62.00 (25.37)	51.4
5	Medical errors are handled appropriately in this ICU.	68.06 (24.99)	67.55 (25.09)	69.00 (25.03)	57.6
11	I receive appropriate feedback about my performance.	44.62 (29.88)	40.16 (30.94)	53.00 (26.07)	27.1
22	I am encouraged by my colleagues to report any patient safety concerns I may have.	67.71 (22.88)	68.35 (22.05)	66.50 (24.54)	66.7
30	I know the proper channels to direct questions regarding patient safety in this ICU.	70.14 (27.78)	74.20 (23.89)	62.50 (32.83)	66.7
12	In this ICU, it is difficult to discuss errors.	53.13 (27.56)	55.05 (28.30)	49.50 (26.00)	38.2
23	The culture in this ICU makes it easy to learn from the errors of others.	57.29 (27.71)	58.78 (30.83)	54.50 (20.63)	41.7
TOTAL		**60.66 (12.67)**	**61.25 (13.20)**	**59.57 (11.67)**	**49.9**

Teamwork climate domain was rated negatively by all participants with a mean of 64.91 (SD, 13) (see Table 4-4). Eighty-five of the total participants (59%) rated all items with positive scores (>75). Again, Hospital A participants rated the domain higher (mean= 66.55, SD 6.78) than Hospital B participants (mean= 61.75, SD 13.41). From the total sample, no positive overall scores were recorded. However, Hospital A participants rated item number 37 from the teamwork climate domain positively (mean= 76.34, SD 18.19).

Table 4-4 Teamwork climate domain items

	TEAMWORK CLIMATE	**Total Sample (n= 144)**	**Hospital A (n= 94)**	**Hospital B (n= 50)**	**% +ve responses (>75)**
		Mean (SD)	**Mean (SD)**	**Mean (SD)**	
37	It is easy for personnel in this ICU to ask questions when there is something that they do not understand.	73.43 (20.95)	76.34 (18.19)	68.00 (24.76)	77.1
36	I have the support I need from other personnel to care for patients.	68.06 (24.81)	70.48 (21.68)	63.50 (29.54)	63.9
3	Nurse input is well received in this ICU.	70.80 (22.40)	69.35 (20.57)	73.50 (25.46)	63.9
26	In this ICU, it is difficult to speak up if I perceive a problem with patient care.	53.32 (28.39)	55.38 (28.52)	49.50 (28.34)	41.7
32	Disagreements in this ICU are resolved appropriately (i.e., not who is right but what is best for the patient).	61.71 (27.55)	66.40 (25.40)	53.00 (29.73)	56.3
40	The physicians and nurses here work together as a well-coordinated team.	62.15 (28.20)	61.70 (29.03)	63.00 (26.84)	53.5
TOTAL		**64.91 (13.00)**	**66.55 (06.78)**	**61.75 (13.41)**	**59.4**

The participants' attitudes to stress recognition items are described in Table 4-5. All participants scored the domain negatively (mean= 60.76, SD 24.17). Over half of all participants (n= 80, 55.9%) rated the domain items with positive scores. Similar to previous domains, Hospital A participants rated the total items significantly higher (mean= 66.82, SD 23.72) than Hospital B participants (mean= 49.38, SD 20.83). All items were scored negatively by participants, however, the former hospital rated the item numbered 27 positively (mean= 77.13, SD 26.35). No other items from the stress recognition domain scored positively from either site.

Table 4-5 Stress recognition domain items

	STRESS RECOGNITION	Total Sample (n= 144)	Hospital A (n= 94)	Hospital B (n= 50)	% +ve responses (>75)
		Mean (SD)	Mean (SD)	Mean (SD)	
27	When my workload becomes excessive, my performance is impaired.	71.53 (28.14)	77.13 (26.35)	61.00 (28.64)	69.4
34	I am more likely to make errors in tense or hostile situations.	57.29 (34.59)	65.69 (32.79)	41.50 (32.58)	45.8
49	Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).	50.35 (32.92)	55.59 (30.93)	40.50 (34.59)	50.0
33	I am less effective at work when fatigued.	63.89 (32.09)	68.88 (29.71)	54.50 (34.51)	58.3
TOTAL		**60.76 (24.17)**	**66.82 (23.72)**	**49.38 (20.83)**	**55.9**

All participants rated the perception of management domain as low (mean= 47.14, SD 19.00) (see Table 4-6). Of the participants 49 (33.9%) had positive scores for four items allocated under the domain. However, no single item scored >75. Hospital B participants rated the domain items (mean= 51.75, SD 18.12) higher than Hospital A (mean= 44.68, SD 19.10).

Table 4-6 Perception of management domain items

	PERCEPTIONS OF MANAGEMENT	Total Sample (n= 144)	Hospital A (n= 94)	Hospital B (n= 50)	% +ve responses (>75)
		Mean (SD)	Mean (SD)	Mean (SD)	
18	Hospital management does not knowingly compromise the safety of patients.	55.42 (28.48)	52.39 (26.71)	61.22 (31.07)	39.6
10	Hospital administration supports my daily efforts.	35.94 (29.67)	34.31 (31.96)	39.00 (24.83)	20.8
28	I am provided with adequate, timely information about events in the hospital that might affect my work.	60.66 (24.73)	58.87 (22.01)	64.00 (29.08)	47.9
19	The levels of staffing in this ICU are sufficient to handle the number of patients.	35.99 (33.85)	32.88 (34.95)	41.84 (31.20)	27.1
TOTAL		**47.14 (19.00)**	**44.68 (19.10)**	**51.75 (18.12)**	**33.9**

Working condition domain is presented in Table 4-7. Again, participants rated the domain negatively with a mean of 58.55 (SD 18.62). Only, 51.4% (n= 73) of participants rated the allocated

items positively (>75). Both sites scored the items of working condition domain similarly, (mean= 58.05, SD 18.37) for Hospital A, and (mean= 59.50, SD 19.24) for Hospital B. No items were rated with scores >75.

Table 4-7 Working condition domain items

WORKING CONDITION		Total Sample (n= 144)	Hospital A (n= 94)	Hospital B (n= 50)	% +ve responses (>75)
		Mean (SD)	Mean (SD)	Mean (SD)	
7	All the necessary information for diagnostic and therapeutic decision is routinely available to me.	66.67 (23.09)	66.49 (21.55)	67.00 (25.97)	66.7
24	This hospital deals constructively with problem personnel.	56.08 (26.65)	59.57 (24.89)	49.50 (28.79)	43.1
45	Trainees in my discipline are adequately supervised.	56.42 (29.23)	56.65 (29.82)	56.00 (28.37)	48.6
6	This hospital does a good job for training new personnel.	55.03 (32.60)	49.47 (33.19)	65.50 (28.97)	47.2
TOTAL		**58.55 (18.62)**	**58.05 (18.37)**	**59.50 (19.24)**	**51.4**

Finally, the attitude of participants to the job satisfaction domain was negative with a mean of 70.36 (SD 14.94) (see Table 4-8). However, item number 2, "I like my job", was rated positively (>75) by both hospitals. Over 66 % (n= 97) of participants rated the domain items positively. Hospital A participants rated the domain items (mean= 73.38, SD 13.50) higher than Hospital B participants (mean= 64.70, SD 15.99). Noticeably, Hospital A rated three items (2, 31 and 44) positively. Similarly, Hospital B scored item number 2 positively (>75).

Table 4-8 Job satisfaction domain items

JOB SATISFACTION		Total Sample (n= 144)	Hospital A (n= 94)	Hospital B (n= 50)	% +ve responses (>75)
		Mean (SD)	Mean (SD)	Mean (SD)	
2	I like my job.	86.98 (21.92)	86.44 (22.80)	88.00 (20.35)	84.7
15	This hospital is a good place to work.	60.07 (29.61)	65.69 (25.92)	49.50 (33.31)	53.5
31	I am proud to work at this hospital.	73.44 (27.45)	78.99 (23.27)	63.00 (31.64)	73.6
8	Working in this hospital is like being part of a large family.	57.99 (29.81)	55.59 (29.59)	62.50 (29.99)	48.6
44	Morale in this ICU is high.	73.43 (24.32)	80.38 (19.80)	60.50 (26.77)	68.1
TOTAL		**70.36 (14.94)**	**73.38 ± 13.50**	**64.70 ± 15.99**	**66.7**

4.4.2.1 Number of participants with a positive attitude to patient safety

This section summarises the number and percentage of participants who scored positive to the identified domains. Over 49% (n= 71) participants in the two hospitals had a positive attitude to patient safety in regards to job satisfaction, which is higher in comparison to other domains (see Table 4-9). However, participants from Hospital A were more positive for job satisfaction (x^2 = 19.282, p= 0.000), stress recognition (x^2 = 31.717, p= 0.000), working conditions (x^2 = 5.444, p= 0.02), teamwork climate (x^2 = 8.758, p= 0.003) and safety climate (x^2 = 6.545, p= 0.010). However, perception of management scores were not significantly different between hospitals. Overall, Hospital A participants had more positive attitudes towards patient safety than Hospital B participants in the majority of domains.

Table 4-9 Number and percentages of respondents who scored positively

Domain	% + ve responses (score ≥ 75)			x^2	P value
	Total sample (n=144)	Hospital A (n=94)	Hospital B (n=50)		
Safety Climate	22 (15.3%)	17 (18.1%)	5 (10.0%)	6.545	0.010 (<0.05)
Teamwork Climate	33 (22.9%)	25 (26.6%)	8 (16.0%)	8.758	0.003 (<0.01)
Stress Recognition	53 (36.8%)	47 (50.0%)	6 (12.0%)	31.717	0.000 (<0.001)
Perceptions of Management	14 (9.7%)	7 (7.4%)	7 (14.0%)	N/A	1.00 (>0.05)
Working Condition	36 (25.0%)	25 (26.6%)	11 (22.0%)	5.444	0.02 (<0.05)
Job Satisfaction	71 (49.3%)	54 (57.4%)	17 (34.0%)	19.282	0.000 (<0.001)

4.4.2.2 Differences in safety attitude between bedside nurses and leaders

As seen in Table 4-10, both groups had a clear negative attitude towards patient safety in regards to the six domains. However, nurse leaders showed an overall higher attitude in all domains (mean= 65.39, SD 8.69) than bedside nurses (mean= 60.61, SD 7.16) although this did not reach significance (p= 0.052). Nurse leaders rated higher in five domains, but not in stress recognition, where bedside nurses rated higher. There was one significant difference between both groups related to the perception of management domain, where leaders rated higher than bedside nurses (mean= 58.13 and 44.34 respectively, p= 0.015).

Table 4-10 Differences in safety attitude between bedside nurses and leaders

Domains	***Professions***	**n**	**Mean (SD)**	**t Value**	***P* Value**
Safety Climate	*Nurses*	96	60.23 (13.00)	1.092	0.227
	Leaders	10	65.00 (14.56)		
Teamwork Climate	*Nurses*	96	64.86 (11.98)	0.842	0.402
	Leaders	10	68.33 (16.34)		
Stress Recognition	*Nurses*	96	62.43 (24.59)	1.866	0.065
	Leaders	10	46.88 (29.94)		
Perceptions of Management	*Nurses*	96	44.34 (19.45)	2.818	0.015
	Leaders	10	58.13 (14.15)		
Working Condition	*Nurses*	96	57.94 (19.50)	1.185	0.239
	Leaders	10	65.63 (19.60)		
Job Satisfaction	*Nurses*	96	68.18 (15.03)	0.937	0.351
	Leaders	10	73.00 (19.75)		
Overall	***Nurses***	**96**	**60.61 (07.16)**	**1.970**	**0.052**
	Leaders	**10**	**65.39 (08.69)**		

4.4.2.3 Differences in safety attitudes between nurses and physicians

There were no significant differences between nurses (n= 96) and physicians (n=23) towards patient safety in their ICUs, except that physicians had higher attitude scores towards patient safety than nurses (mean= 61.92 and 59.66 respectively, *p*= 0.284) (see Table 4-11). However, nurses had a higher attitude than physicians in regard to teamwork climate (mean= 64.86 and 64.64 respectively, *p*= 0.94). In contrast, physicians rated higher in safety climate, stress recognition, perception of management, work conditions and the job satisfaction domains (mean= 60.25, 66.58, 48.64, 58.70 and 72.72 respectively) than nurses (mean= 60.23, 62.43, 44.34, 57.94 and 68.18 respectively) with no significant differences.

Table 4-11 Differences in safety attitude between nurses and physicians

Domains	***Professions***	**n**	**Mean (SD)**	**t Value**	**P Value**
Safety Climate	*Nurses*	96	60.23 (13.00)	0.006	0.995
	Physicians	23	60.25 (13.63)		
Teamwork Climate	*Nurses*	96	64.86 (11.98)	0.057	0.942
	Physicians	23	64.64 (17.84)		
Stress Recognition	*Nurses*	96	62.43 (24.59)	0.748	0.456
	Physicians	23	66.58 (20.35)		
Perceptions of Management	*Nurses*	96	44.34 (19.45)	0.951	0.343
	Physicians	23	48.64 (19.68)		
Working Condition	*Nurses*	96	57.94 (19.50)	0.172	0.864
	Physicians	23	58.70 (16.07)		
Job Satisfaction	*Nurses*	96	68.18 (15.03)	1.673	0.175
	Physicians	23	72.72 (10.74)		
Overall	***Nurses***	**96**	**59.66 (09.00)**	**1.075**	**0.284**
	Physicians	**23**	**61.92 (09.18)**		

4.4.2.4 Differences in safety attitudes between RTs and physicians

Overall, there were no significant differences between both groups, where the attitudes of physicians (mean= 61.92, SD 9.18) rated in a similar fashion to those of RTs (mean= 61.14, SD 5.34, *p*= 0.769) (see Table 4-12). However, only the stress recognition domain was rated significantly higher by physicians (mean= 66.58, SD 20.35) in comparison to RTs (mean= 50.42, SD 17.59, *p*= 0.016). In general, RTs had a higher attitude to patient safety in the safety climate and perception of management domains (mean= 61.19 and 55.42 respectively) than physicians (mean= 60.25, *p*= 0.81 and mean= 48.64, *p*= 0.25 respectively). Physicians, on the other hand, showed a higher attitude in the teamwork climate (mean= 64.64) and working condition domains (mean= 58.70) than RTs (mean= 63.33, *p*= 0.79 and mean= 57.50, *p*= 0.83 respectively). Noticeably, RTs had a positive attitude to patient safety in the job satisfaction domain (mean= 79, SD 13.78) while physicians rated the same domain negatively (mean= 72.72, SD 10.74, *p*= 0.124).

Table 4-12 Differences in safety attitude between RT and physicians

Domains	***Professions***	**n**	**Mean (SD)**	**t Value**	***P* Value**
Safety climate	*RT*	15	61.19 (6.99)	0.246	0.807
	Physicians	23	60.25 (13.63)		
Teamwork climate	*RT*	15	63.33 (8.36)	0.264	0.793
	Physicians	23	64.64 (17.84)		
Stress recognition	*RT*	15	50.42 (17.59)	2.520	0.016*
	Physicians	23	66.58 (20.35)		
Perceptions of management	*RT*	15	55.42 (12.91)	1.176	0.247
	Physicians	23	48.64 (19.68)		
Working condition	*RT*	15	57.50 (16.40)	0.222	0.825
	Physicians	23	58.70 (16.07)		
Job satisfaction	*RT*	15	79.00 (13.78)	1.567	0.124
	Physicians	23	72.72 (10.74)		
Overall	***RT***	**15**	**61.14 (5.34)**	**0.296**	**0.769**
	Physicians	**23**	**61.92 (9.18)**		

4.4.2.5 Differences in safety attitude between male and female

As shown in Table 4-13, there was no significant difference between males and females in attitudes towards patient safety. However, male participants showed almost high attitude (mean= 62.19, SD 8.40) than female participants (mean= 60, SD 8.84, *p*= 0.251). Of note, male participants rated the teamwork climate, stress recognition, perception of management and job satisfaction domains higher (mean= 66.79, 66.35, 49.52 and 71.73 respectively). In contrast, female participants rated the working condition and safety climate domains higher (mean= 58.63 and 60.68 respectively).

Table 4-13 Differences in safety attitude according to gender (n=144)

Domains	***Gender***	**n**	**Mean (SD)**	**t Value**	***P* Value**
Safety climate	*Male*	26	60.58 (12.76)	0.039	0.969
	Female	118	60.68 (12.71)		
Teamwork climate	*Male*	26	66.79 (13.76)	0.817	0.415
	Female	118	64.49 (12.85)		
Stress recognition	*Male*	26	66.35 (20.47)	1.304	0.194
	Female	118	59.53 (24.82)		
Perceptions of management	*Male*	26	49.52 (19.92)	0.705	0.482
	Female	118	46.61 (18.84)		
Working condition	*Male*	26	58.17 (15.79)	0.114	0.910
	Female	118	58.63 (19.25)		
Job satisfaction	*Male*	26	71.73 (9.59)	0.514	0.608
	Female	118	70.06 (15.90)		
Overall	*Male*	26	62.19 (8.40)	**1.152**	**0.251**
	Female	118	60.00 (8.84)		

4.4.2.6 Differences in safety attitude between nurses, RTs and physicians

Differences in safety attitude between three groups were examined using one-way between groups analysis of variance (ANOVA). There was only one significant difference between the three groups in the job satisfaction domain (F (2, 133) = 4.2, p= 0.017) (see Table 4-14). Post- hoc comparisons using the least significant difference (LSD) test revealed that the significant differences in job satisfaction were between RTs and nurses. The mean score for RTs was 79 (SD 13.78) and 68.18 (SD 15.03) for nurses with a mean difference of 10.82, while physicians rated the job satisfaction domain at a mean of 72.72 (SD 10.74) (see Table 4-15).

Table 4-14 Differences in safety attitude between nurses, RTs and physician

Domains		**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Safety climate	*Between Groups*	12.190	2	6.095	0.038	0.962
	Within Groups	20836.500	131	159.057		
	Total	20848.690	133			
Teamwork climate	*Between Groups*	30.286	2	15.143	0.092	0.912
	Within Groups	21611.795	131	164.976		
	Total	21642.081	133			
Stress recognition	*Between Groups*	2507.054	2	1253.527	2.316	0.103
	Within Groups	70903.918	131	541.251		
	Total	73410.972	133			
Perceptions of management	*Between Groups*	1743.076	2	871.538	2.440	0.091
	Within Groups	46797.846	131	357.235		
	Total	48540.922	133			
Working condition	*Between Groups*	15.128	2	7.564	0.022	0.978
	Within Groups	45579.554	131	347.936		
	Total	45594.683	133			
Job satisfaction	*Between Groups*	1700.069	2	850.035	4.178	0.017*
	Within Groups	26652.403	131	203.453		
	Total	28352.472	133			
Overall rating of SAQ	***Between Groups***	120.189	2	60.095	1.185	0.309
	Within Groups	6642.815	131	50.709		
	Total	6763.004	133			

Table 4-15 LSD Test for differences between groups

Domain	***Professions***	**n**	**Mean (SD)**	**Differences LSD**
Job satisfaction	*Nurse*	96	68.18 (15.03)	Between *RT* and *Nurses* Mean difference (10.82)
	RT	15	79.00 (13.78)	
	Physician	23	72.72 (10.74)	
	Total	134	70.17 (14.60)	

LSD= least significant difference

4.4.2.7 Selected independent variables and the six domains

The Pearson (*r*) Correlation Coefficient was utilised to find out if there was a linear correlation between the six domains and the year of experience in primary speciality and in current ICUs and their age. From the six domains, only stress recognition had a statistical significance (a positive correlation) between year of experience in specialty (r= 0.239, p= 0.01) and age (r= 0.254,

p= 0.01), indicating that the increases in age and years of experience in specialty areas is associated with high stress recognition among staff (see Table 4.16).

Table 4-16 Pearson correlation between safety attitude level and selected independent variables

Domains	**Years of experience in your specialty**	**Years of working in this ICU**	**Age**
Safety climate	-0.068	-0.074	-0.038
Teamwork climate	0.065	0.084	0.084
Stress recognition	0.239*	0.103	0.254*
Perceptions of management	-0.044	0.046	-0.022
Working condition	-0.089	-0.041	-0.033
Job satisfaction	0.023	-0.008	0.071
SAQ	0.020	0.029	0.050

4.5 The quality of collaboration and communication experienced among ICU team members

This section describes the quality of collaboration and communication experienced with other healthcare members. A total of 14 items were used to describe this concept. The response rate from Hospital A was 95% (n= 89), and the response rate for Hospital B participants was 100% (n= 50). In the following sections, the quality of collaboration and communication experienced by healthcare members according to professions and gender are discussed. Results are presented in five tables; Table 4.18 presents grouped data from all participants according to their perceptions of the quality of communication and collaboration with individual professions. Tables 4.19 - 4.22 compare the results by hospital, by bedside nurses and lead nurses, between nurses and physicians, and by gender.

4.5.1 The quality of collaboration and communication experienced among ICU healthcare team members in Hospitals A and B

The nurses, RTs and physicians of both hospitals rated the quality of collaboration and communication experienced within each other and with other team members using the 6-point Likert scale. The overall mean of total participants (n= 144) was 2.79 (SD 0.81), indicating that the collaboration and communication experienced among the ICU healthcare teams was adequate (see Table 4-17). In general, participants rated the quality of collaboration and communication experienced with CNs, critical care residents, NM/HNs, critical care registered nurses (RN), RTs, critical care intensivists and physicians (medical and surgical) between adequate to high. On the other hand, the collaboration and communication experienced with pharmacists, fellows (surgical and medical), critical care licenced vocational nurses (LVNs)/licence practice nurses (LPNs), nursing aides and secretaries was rated either low or very low.

Table 4-17 Overall participant rating of the quality of collaboration and communication with colleagues

Quality of collaboration and communication experienced with	Mean (SD)
CN	3.89 (0.98)
Critical Care Resident	3.61 (1.18)
NM/HN	3.51 (1.06)
Critical Care RN	3.51 (1.30)
RT	3.33 (1.08)
Critical Care Intensivist	3.33 (1.46)
Physician (Medical)	3.32 (1.01)
Physician (Surgical)	3.28 (0.90)
Pharmacist	2.76 (1.03)
Fellow (Surgical)	2.66 (3.91)
Fellow (Medical)	2.33 (1.62)
Critical Care LVN/LPN	1.10 (1.72)
Nursing Aide	1.01 (1.66)
Secretary	0.86 (1.54
Overall Mean	2.79 (0.81)

4.5.2 The difference between Hospitals A and B in the quality of collaboration and communication

Both ICUs had similar overall scores with a mean of 2.80 (SD 0.67) for Hospital A and a mean of 2.76 (SD 1.02) for Hospital B, p= 0.79 (see Table 4-18). However, there were statistically significant differences between both hospitals in three items. Hospital A participants rated the collaboration and communication experienced with NM/HN (mean= 3.67, SD 0.94) higher than Hospital B (mean= 3.20, SD 1.21, p= 0.01). Likewise, Hospital A respondents ranked their

experience with intensivists as higher (mean= 3.15, SD 1.63) than Hospital B (mean= 3.66, SD 1.02, *p*= 0.024). Hospital A respondents also rated the quality of collaboration and communication experienced with pharmacists higher (mean= 2.91, SD= 0.91) than Hospital B respondents (mean= 2.48, SD 1.18, *p*= 0.028).

Table 4-18 Quality of collaboration and communication in Hospital A and Hospital B

Quality of collaboration and communication experienced with	Mean ±SD			P Value
	Total sample (n=144)	Hospital A (n=94)	Hospital B (n=50)	
CN	3.89 ± 0.98	3.94 ± 0.90	3.80 ± 1.11	0.427
NM/HN	3.51 ± 1.06	3.67 ± 0.94	3.20 ± 1.21	0.01*
Critical Care RN	3.51 ± 1.30	3.37 ±1.47	3.78 ± 0.89	0.037
Critical Care LVN/LPN	1.10 ± 1.72	0.95 ±1.66	1.34 ± 1.80	0.207
Critical Care Intensivist	3.33 ± 1.46	3.15 ± 1.63	3.66 ± 1.02	0.024*
Critical Care Resident	3.61 ± 1.18	3.69 ±1.15	3.46 ± 1.23	0.272
Physician (Medical)	3.32 ±1.01	3.44 ±0.90	3.12 ± 1.17	0.078
Physician (Surgical)	3.28 ± 0.90	3.34 ±0.76	3.18 ± 1.10	0.351
Pharmacist	2.76 ± 1.03	2.91 ±0.91	2.48 ± 1.18	0.028*
RT	3.33 ± 1.08	3.41 ±1.06	3.18 ± 1.12	0.222
Nursing Aide	1.01 ± 1.66	1.07 ±1.66	0.92 ± 1.68	0.615
Secretary	0.86 ± 1.54	0.71 ±1.36	1.12 ± 1.80	0.170
Fellow (Medical)	2.33 ± 1.62	2.35 ±1.57	2.30 ± 1.71	0.855
Fellow (Surgical)	2.66 ± 3.91	2.40 ± 1.55	3.10 ± 6.12	0.317
Overall	**2.79 ± 0.81**	**2.80 ± 0.67**	**2.76 ± 1.02**	**0.788**

4.5.3 Communication and collaboration among ICU bedside nurses and leaders

As shown in Table 4-19, bedside nurses tended to rate the collaboration and communication experienced with physicians (surgical) higher (mean= 3.22, SD 0.79) than nurse leaders (mean= 2.55, SD 0.71, *p* = 0.007). Also, the collaboration and communication experienced with pharmacists was rated as adequate but higher by bedside nurses (mean= 2.90, SD 0.91) than leaders (mean= 1.90, SD 1.10, *p*= 0.002). However, the quality of collaboration and communication experienced with CNs, NM/HNs, nurses, intensivists and residents was rated either high or very high by bedside nurses and nurse leaders with no statistically significant

differences. Overall, bedside nurses and leaders rated the quality of collaboration and communication experienced with all professions as adequate with no statistically significant differences (mean= 2.66, SD 0.70 and mean= 2.42, SD 0.69 respectively, *p*= 0.308).

Table 4-19 Quality of collaboration and communication between bedside nurses and leaders

Quality of collaboration and communication experienced with	**Professions**	**n**	**Mean (SD)**	**t Value**	**P Value**
CN	*Nurses*	96	3.96 (0.93)	0.456	0.649
	Leaders	10	4.10 (0.99)		
NM/HN	*Nurses*	96	3.55 (0.94)	0.774	0.441
	Leaders	10	3.30 (1.34)		
Critical Care RN	*Nurses*	96	3.39 (1.47)	0.372	0.715
	Leaders	10	3.50 (0.85)		
Critical Care LVN/LPN	*Nurses*	87	1.05 (1.67)	0.083	0.934
	Leaders	10	1.00 (1.63)		
Critical Care Intensivist	*Nurses*	95	3.01 (1.52)	0.191	0.849
	Leaders	9	3.11 (1.36)		
Critical Care Resident	*Nurses*	96	3.41 (1.24)	0.436	0.663
	Leaders	9	3.22 (0.83)		
Physician (Medical)	*Nurses*	89	3.27 (0.95)	1.161	0.249
	Leaders	10	2.90 (0.99)		
Physician (Surgical)	*Nurses*	89	3.22 (0.79)	2.763	0.007*
	Leaders	10	2.50 (0.71)		
Pharmacist	*Nurses*	92	2.90 (0.91)	3.226	0.002*
	Leaders	10	1.90 (1.10)		
RT	*Nurses*	94	3.10 (1.00)	0.291	0.772
	Leaders	10	3.00 (0.94)		
Nursing Aide	*Nurses*	89	0.79 (1.47)	1.015	0.312
	Leaders	10	1.30 (1.89)		
Secretary	*Nurses*	89	0.57 (1.26)	1.065	0.312
	Leaders	10	1.20 (1.81)		
Fellow (Medical)	*Nurses*	87	2.00 (1.52)	1.202	0.232
	Leaders	10	1.40 (1.26)		
Fellow (Surgical)	*Nurses*	87	2.06 (1.48)	1.347	0.181
	Leaders	10	1.40 (1.26)		
Overall	***Nurses***	**96**	**2.66 (0.70)**	**1.023**	**0.308**
	Leaders	**10**	**2.42 (0.69)**		

4.5.4 Communication and collaboration between nurses and physicians

There were obvious differences between nurses and physician towards the quality of collaboration and communication experienced with different groups (see Table 4-20). Physicians rated their experiences with intensivists higher (mean= 4.65, SD 0.57) than nurses did (mean= 3.01, SD 1.52, *p*= 0.000). Also, physicians tended to rate the collaboration and communication among themselves higher (mean= 4.57, SD 0.59), while nurses rated their experiences with residents as adequate to high (mean= 3.41, SD 1.24, *p*= 0.000). Similarly, physicians rated the communication and collaboration with RTs higher (mean= 4.09, SD 0.79) than nurses did (mean= 3.10, SD 1.00, *p*= 0.000). Physicians ranked the experience with fellows (medical) significantly higher (mean= 3.78, SD 1.28) than nurses did (mean= 2.00, SD 1.52, *p*= 0.000). Interestingly, physicians rated the communication and collaboration with critical care nurses higher than the nurses did for each other (mean= 3.96, SD 0.82 and mean= 3.39, SD 1.47 respectively, *p*= 0.015).

The communication and collaboration experienced with physicians (medical) was rated higher by physicians (mean= 3.87, SD 1.22) than by nurses (mean= 3.27, SD 0.95, *p*= 0.012). Likewise, the communication and collaboration experienced with physicians (surgical) were rated higher by physicians (mean= 3.91, SD 1.12) than by nurses (mean= 3.22, SD 0.79, *p*= 0.001). Thus, the overall results indicated that physicians rated the collaboration and communication experienced with other healthcare providers higher (mean= 3.42, SD 0.95) than nurses did (mean= 2.66, SD 0.70, *p*= 0.000).

Table 4-20 Quality of collaboration and communication between nurses and physicians

Quality of collaboration and communication experienced with	Professions	n	Mean (SD)	t value	P value
CN	*Nurses*	96	3.96 (0.93)	1.163	0.247
	Physicians	23	3.70 (1.15)		
NM/HN	*Nurses*	96	3.55 (0.94)	0.126	0.900
	Physicians	23	3.52 (1.38)		
Critical Care RN	*Nurses*	96	3.39 (1.47)	2.504	0.015*
	Physicians	23	3.96 (0.82)		
Critical Care LVN/LPN	*Nurses*	87	1.05 (1.67)	0.225	0.823
	Physicians	22	0.95 (1.84)		
Critical Care Intensivist	*Nurses*	95	3.01 (1.52)	8.360	0.000**
	Physicians	23	4.65 (0.57)		
Critical Care Resident	*Nurses*	96	3.41 (1.24)	6.578	0.000**
	Physicians	23	4.57 (0.59)		
Physician (Medical)	*Nurses*	89	3.27 (0.95)	2.540	0.012*
	Physicians	23	3.87 (1.22)		
Physician (Surgical)	*Nurses*	89	3.22 (0.79)	3.381	0.001**
	Physicians	23	3.91 (1.12)		
Pharmacist	*Nurses*	92	2.90 (0.91)	0.551	0.583
	Physicians	23	2.78 (1.00)		
RT	*Nurses*	94	3.10 (1.00)	4.439	0.000**
	Physicians	23	4.09 (0.79)		
Nursing Aide	*Nurses*	89	0.79 (1.47)	1.207	0.237
	Physicians	23	1.30 (1.92)		
Secretary	*Nurses*	89	0.57 (1.26)	1.520	0.140
	Physicians	23	1.22 (1.93)		
Fellow (Medical)	*Nurses*	87	2.00 (1.52)	5.711	0.000**
	Physicians	23	3.78 (1.28)		
Fellow (Surgical)	*Nurses*	87	2.06 (1.48)	1.925	0.067
	Physicians	23	5.48 (8.49)		
Overall	***Nurses***	**96**	**2.66 (0.70)**	**4.350**	**0.000****
	Physicians	**23**	**3.42 (0.95)**		

***Significant at level 0.01* **Significant at level 0.05*

4.5.5 Communication and collaboration experienced with other healthcare team members according to gender

As per Table 4-21, male participants rated their communication and collaboration with intensivists higher (mean= 4.19, SD 0.94) than female participants did (mean= 3.14, SD 1.49, *p*= 0.000). Male participants also rated their experiences with critical care residents higher (mean= 4.08, SD 1.20) than female did (mean= 3.50, SD 1.16, *p*= 0.025). Again, male participants rated

experiences with physicians (medical and surgical) (mean= 3.77, SD 0.86) higher than female did (mean= 3.22, SD 1.02) with physician (medical and surgical) (mean= 3.17, SD 0.87), with statistically significant differences (p= 0.012 and p= 0.002 respectively).

Similarly, male participants rated their communication and collaboration with RTs higher (mean= 3.88, SD 0.95) than female did (mean= 3.21, SD 1.08, p= 0.004). Female participants rated their communication and collaboration with fellows (medical) as low to adequate (mean= 2.08, SD 1.56), while males rated them higher (mean= 3.38, SD 1.44, p= 0.000). The overall ratings showed that male participants in both hospitals tended to rate the communication and collaboration experienced with other healthcare members higher (mean= 3.28, SD 0.97) than female participants (mean= 2.68, SD 0.73, p= 0.001). Thus, male participants ranked the quality of collaboration and communication experienced with other team members as high, while females ranked them as adequate.

Table 4-21 Quality of collaboration and communication between male and female

Quality of collaboration and communication experienced with	Gender	N	Mean (SD)	t Value	*P* Value
CN	*Male*	26	3.92 (0.84)	0.197	0.844
	Female	118	3.88 (1.01)		
NM/HN	*Male*	26	3.73 (1.15)	1.186	0.238
	Female	118	3.46 (1.04)		
Critical Care RN	*Male*	26	3.81 (1.02)	1.287	0.200
	Female	117	3.44 (1.35)		
Critical Care LVN/LPN	*Male*	25	0.88 (1.64)	0.700	0.485
	Female	109	1.15 (1.74)		
Critical Care Intensivist	*Male*	26	4.19 (0.94)	3.449	0.000**
	Female	116	3.14 (1.49)		
Critical Care Resident	*Male*	26	4.08 (1.20)	2.269	0.025*
	Female	117	3.50 (1.16)		
Physician (Medical)	*Male*	26	3.77 (0.86)	2.553	0.012*
	Female	111	3.22 (1.02)		
Physician (Surgical)	*Male*	26	3.77 (0.86)	3.152	0.002**
	Female	111	3.17 (0.87)		
Pharmacist	*Male*	26	2.58 (1.06)	0.988	0.325
	Female	114	2.80 (1.02)		
RT	*Male*	26	3.88 (0.95)	2.962	0.004**
	Female	116	3.21 (1.08)		
Nursing Aide	*Male*	26	1.42 (1.96)	1.221	0.231
	Female	111	0.92 (1.57)		
Secretary	*Male*	26	1.35 (1.90)	1.511	0.141
	Female	111	0.75 (1.44)		
Fellow (Medical)	*Male*	26	3.38 (1.44)	3.880	0.000**
	Female	109	2.08 (1.56)		
Fellow (Surgical)	*Male*	26	5.04 (8.04)	1.860	0.074
	Female	109	2.09 (1.53)		
Overall	***Male***	**26**	**3.28 (0.97)**	**3.561**	**0.001****
	Female	**118**	**2.68 (0.73)**		

***Significant at level 0.01* **Significant at level 0.05*

4.6 Recommendations for improving patient safety in ICUs

An open ended question was also included, asking participants to propose up to three recommendations for improving patient safety in their ICU. From the total number of participants in both ICUs, only 13% (n= 19) of participants provided recommendations to improve patient safety (see Table 4-22). Five themes were extracted from the identified recommendations. These

are: staffing level, communication and teamwork skills, training and education, resources and guidelines, and administration support. The majority of participants (n= 10, 53%) believed that the staffing level in their ICU was inadequate. Some participants (n= 9, 47%) identified that further training and education activities should be considered to improve patient safety. Improving communication and teamwork skills were identified by some participants (n= 6, 32%). Another recommendation was to provide medical resources and guidelines (n= 6, 32%), while seven participants (37%) recommended further action from hospital administration.

Table 4-22 Healthcare professionals' recommendations to improve ICU patient safety

Recommendation (Themes)	Response rate (n =19)	Verbatim responses
Staffing level	10 (53%)	"Adequate staff is needed" "Nurse patient ratio 1:1" "Improve the ration rate to 1:1" "Nurse to patient ration must be improved" "Additional staff in ICU for ventilated patient should be 1:1"
Communication and teamwork skills	6 (32%)	"More and better communication with society" "Improve communication with managers" " Good communication among caregivers" "Proper endorsement" " Teamwork is needed" "Teamwork" "Reporting medical incidents for improvement"
Training and Education	9 (47%)	"Proper training to new staff" "New staff should have at least three months orientation program-departmental" "Need more training" "Identify patient correctly" "Improve hand hygiene compliance" "Fair staff evaluation"
Resources and Guidelines	6 (32%)	"Follow medical guidelines" "Adequate supplies(surgical)" "Improve the incidence reporting system" "Provide barrier protection to stop infection" "Provide more equipment for patient safety purposes" "Document patient preferences for life sustaining treatment"
Administration support	7 (37%)	"More roles from the administration" "Administration support" "Change or improve the admin" "Give off days on time, even the unit is so busy" "Equal treatment to non-Saudi and Saudi is a must" "Salary should increase properly. We should be financially compensated"

4.7 Conclusion

This chapter has presented the results of the questionnaires in five main sections with significant findings. There were statistically significant differences between Hospitals A and B in regards to the number of participants who scored positively in all the domains. There was no statistical significance between bedside nurses and leaders. When comparing the safety attitude between RTs and physicians, there was statistical significance in the stress recognition domain. However, the results showed no significant differences between nurses and physicians as well as between male and female participants in the six domains. According to the ANOVA test, the results showed that there was a statistically significant difference between RTs and nurses in the job satisfaction domains. The Pearson Correlation Coefficient test indicated there was a small, positive correlation between age and year of experience in the specialty and stress recognition domains – the increase in age and year of experience associated with high stress recognition among healthcare members.

In terms of quality of collaboration and communication experienced among and within healthcare professionals, the results revealed that the participants rated their experiences as adequate. When comparing collaboration and communication between Hospital A and Hospital B, it showed that there were statistically significant differences between the two ICUs with NM/HNs, intensivists and pharmacists. In addition, nurses tended to rate the collaboration and communication with physicians (surgical) and pharmacists higher than leaders did, with significant differences. However, physicians ranked the collaboration and communication higher than nurses with almost all professions. In fact, the results showed that physicians rated the communication and collaboration with all professions as high, while nurses rated them as adequate with significant differences. Male participants rated the communication and collaboration with others as high,

while female participants rated them as adequate with statistically significant differences. Several recommendations to improve patient safety in ICU have been presented with five formulated themes. The significance of these results will be discussed in details in the next chapter.

5. Discussion and Conclusion

5.1 Introduction

The study findings, including their implications, are discussed in this chapter, and the significance of participants' attitudes towards the six domains are explored. Further, the responses to the quality of collaboration and communication among healthcare teams are addressed, and the proposed recommendations from participants to improve patient safety in ICUs are highlighted. Finally, the significance of these findings and further recommendations to improve patient safety are presented.

5.2 The attitude of healthcare professionals towards patient safety

In this study, the findings showed that participants had a negative attitude to patient safety in ICUs based on six safety domains, the mean ranging from 47 - 70.4. At both hospitals, the participants rated the domains <75, which is the cut-off point for a positive safety score. The findings in this study are similar to the findings of Abdi et al. (2015) in their study. The nurses and physicians in one Iranian ICU rated the six domains with means of 52 - 73. Similarly, Alayed et al. (2014) in their study in Saudi Arabian ICUs found that 216 nurses rated the domains in the range of 45 - 71. Likewise, another study conducted in a single institution in the United States of America found that different healthcare professionals rated the six domains low to moderate (mean= 43 - 74.9) (Huang et al. 2007). In this present study, Hospital A participants rated the four domains of safety climate, teamwork climate, stress recognition and job satisfaction high, while

Hospital B participants rated the domains of, perception of management and working conditions high.

A similar variation among different ICUs was also observed across five Cyprus ICUs, where it was noticed that ICU A, the biggest in Cyprus, had lower scores in perception of management (mean= 46.01) and job satisfaction (mean= 78.12) than the other ICUs (Raftopoulos & Pavlakis, 2013). The authors attributed these variations to several factors such as size of ICU, number of nurses, organisational culture and appropriate infrastructure. In this study, one of the main reasons for these differences may be due to significant staff shortages in Hospital B. Staff shortage leads to increase workloads, therefore patient safety may be compromised (Carayon & Gürses, 2005). The consequences of such shortages can be a negative impact on staff satisfaction, which can result in a high turnover among healthcare members (Carayon & Gürses, 2005; Scott et al., 2006). Another reason could be related to cultural differences and organisational structure. Different studies attribute the differences of healthcare team attitudes towards patient safety to cultural and organisational differences (Abdi et al., 2015; Alayed et al., 2014; Chaboyer et al., 2013).

5.2.1 Perception of management and working condition domains

There are several important findings related to participants' attitudes to patient safety in this study. The first finding was that the two domains of perception of management and working condition domains were rated extremely low by participants. Interestingly, this finding is consistent with previous studies (Chaboyer et al., 2013; Huang et al., 2007). Participants in Chaboyer et al's (2013) study rated the domains of perception of management and working condition at 54.3 (mean) and 59.1 (mean) respectively. Likewise, nurse participants rated the two domains in Huang et al's (2007) study at 48.92 (mean) for perception of management and 53.94

(mean) for working conditions. These two domains consist of items related to staff ratio, leadership, staff recognition and management. The low score in these two domains indicates that participants had poor attitudes towards hospital environment, logistics supports, training and reward systems. A previous study suggests that ICU staff view hospital administration as a problem which could impact negatively on patient safety (Chaboyer et al., 2013).

5.2.2 Job satisfaction, safety climate, teamwork climate and stress recognition domains

The second finding is that job satisfaction, safety climate, teamwork climate and stress recognition domains were rated higher by participants (the mean ranged from 60 - 70.4), although the scores were under the positive point. Similar findings by (Chaboyer et al., 2013) showed that participants scored the four domains with means between 68.5 - 69.8. Another study found that these four domains were rated higher by nurses (the mean ranged from 68.8 – 72.8) (Huang et al., 2010). The job satisfaction domain items were rated the highest among other items in other domains. The domain was rated significantly higher in Hospital A than Hospital B, which was almost close to the positive point. Both hospitals' participants reacted positively to the statement "like their job". However, Hospital A participants were positive that they feel "proud to work at their hospital", and they felt that "morale in their ICU high". In this regard, the current study concurs with Raftopoulos and Pavlakis (2013),where participants offered extremely high scores to "like my job" (mean= 98.4), "proud to work at their hospital" (mean= 81.4) and perceiving a high morale (mean= 75.82).

The variation in the two hospitals could be related to hospital management attitudes and cultural barriers. The Hospital B participants felt negatively about the item "morale in this ICU is high", which may indicate poor commitment to their job in their ICU (Raftopoulos & Pavlakis,

2013). That may be related to staff shortage, dissatisfaction with managers or lack of teamwork. Raftopoulos and Pavlakis (2013) showed in their study that participants rated the morale in ICU with positive scores which indicted a strong commitment to participants' jobs. The authors found that the two positively scored items, "like my job" and "the hospital is good place to work", suggested high morale among nurses despite their negative responses to fatigue and exhaustion. Other factors relating to high morale could be large ratios of nurses in the ICU and the common cultural diversity (Raftopoulos & Pavlakis, 2013).

One of the important issues in the current study is that the two hospitals are not offering any extra incentives for those working in ICUs, nor providing the opportunity for staff to choose their preferred units. The ICU staff receive the same salary as those working in other departments, which is considered as a disadvantage for them as they are dealing with very complex cases and exposing themselves to a highly stressful environment. Moreover, as most staff working in this unit (90%) are foreigners, they cannot choose the unit of their choice because the allocation of staff comes from the nursing office, unlike local staff who can choose any department. That could explain the negative responses to the job satisfaction domain. Several elements to be considered when allocating staff in ICUs are qualification in the critical care area, ICU past experiences, completion of clinical competency and knowledge of patient acuity (Rischbieth, 2006). Managers in ICUs should create an environment that attracts skilled nurses, including the promotion of financial incentives, such as offering 10-20% extra payment for those who choose to work in ICUs (Vetter, Felice, & Ingersoll, 2001). Factors such as salary, recognition and staff development programs in ICUs have been associated with job satisfaction (Klopper, Coetzee, Pretorius, & Bester, 2012).

Furthermore, teamwork climate domain was almost rated with equal negative scores by all participants. There was a wide agreement among participants that their ICU was not safe, and that medical errors and safety issues were not communicated. Teamwork climate consists of items related to communication, coordination and leadership. Factors such as cultural background and language barriers could be responsible for an unsafe clinical workplace (Almutairi et al., 2013). Further, the negative responses to the allocated items could be due to poor skills in decision making, disagreement among staff, years of experience in the ICU and lack of collaboration, which may all lead to poor patient safety (Reader, Flin, Mearns, & Cuthbertson, 2009).

The median of work experience of participants in ICUs in this study was 2.00 years, which could reflect on the scores of teamwork climate and stress recognition domains. Raftopoulos and Pavlakis (2013) revealed that when ICU staff have more years of experience, their perception on teamwork will be positive. They added that safety climate in ICUs reflects on the safety of patient, and the management of adverse events and errors.

The stress recognition domain was rated low by all participants and very low by Hospital B participants. Such findings could be attributed to certain coping mechanisms that can be applied during stressful events (Raftopoulos & Pavlakis, 2013). Over 80% of participants in our study were under the age of 29, which may explain the rationale of low scores in stress recognition. Raftopoulos and Pavlakis (2013) stated in their findings that young nurses are more likely to cope with stressors than older ones. Also, as indicated in the current study, there was an association between years of experience and age of participants and their stress recognition. It showed that when the years of experience in speciality and age increases, the stress recognition among staff would be more likely to be recognised. Raftopoulos and Pavlakis (2013) stated that when nurses in ICUs had more experience, they would recognise stress more often than junior sta.

5.2.3 Attitude to safety according to job categories

The third finding was related to the significant differences between ICU job categories and patient safety attitudes. The findings showed that there was no significant difference between bedside nurses and leaders. Overall, the results showed that leaders had better attitudes than bedside nurses towards patient safety, particularly in the perception of management domain. The current finding is consistent with the Huang et al. (2010) study where leaders rated the six domains higher than bedside nurses. Perception of management was rated (mean= 67.5) by leaders and (mean= 60.6) by bedside nurses. Similarly, another study found that leader participants rated the safety climate more positively than nurses did (Kho, Carbone, Lucas, & Cook, 2005). One explanation could be that leaders have more involvement in quality projects and educational and safety programs (Kho et al., 2005). On the contrary, a study conducted in ten ICUs in Australia found that leaders tended to rate the perception of management (mean= 52) lower than bedside nurses did (mean= 55.9) (Chaboyer et al., 2013). The findings could be attributed to leaders having close and regular contact with hospital administrators to negotiate particular issue such as staff shortages. On some occasions, leaders may find no support or responses from the main administration, leading to poor attitude in perception of management (Chaboyer et al., 2013).

Moreover, in this present study there was a similar perception of safety culture between nurses and physicians. However, contrary to this study, other research has shown that there are differences in attitudes between nurses and physicians (Chaboyer et al., 2013). The findings showed that physicians tended to rate the domains of job satisfaction, teamwork climate, safety climate and working conditions significantly higher (mean= 77.1, 79.9, 75.2 and 67.9 respectively) than nurses did (mean= 67.6, 68.8, 67.8 and 57.6 respectively, p= < 0.001. Another study revealed similar findings where physicians rated all domains (mean= 81.2-69.1) higher than nurses did

(mean= 72.5-59.9) (Huang et al., 2010). The occurrence of variation between the two mentioned groups could be attributed to several factors such as status, gender, qualifications, training and responsibilities, which may influence their decisions (Chaboyer et al., 2013; Thomas, Sexton, & Helmreich, 2003).

RTs and physicians shared similar attitudes except on stress recognition. The study by Huang et al., (2007) shows that RTs rated five domains similar to physicians, but not stress recognition, where the latter rated it higher (mean= 74.97) than RTs (mean= 60.54). However, the authors did not mention the reasons for these differences. One of the highlighted results of RTs was the positive response to the job satisfaction domain in this study. RTs in both sites have certain roles, and they do not need to be with the patient at all times as physicians and nurses do, which means they are called to see patients if needed. Adding to that, over 70% of RTs in these ICUs were originally nurses who have completed minor courses in respiratory therapy fields, but are not authorised by the registration board to act as RTs. This is an internal arrangement from the hospital to bypass certain requirements of the accreditation agency. The previous explanation of their limited roles and qualification could contribute to such positive responses. However, there is a lack of evidence in the literature to confirm the association between RTs and job satisfaction. Further research to explore this hypothesis is needed. Of note, there was a significant difference between job satisfaction for nurses and RTs, indicating that the RTs were responding according to their current roles rather than their previous nursing role.

5.3 The quality of collaboration and communication among participants

The fourth finding was related to communication and collaboration. Participants tended to rate communication and collaboration higher with CNs than with any other personnel. A possible explanation could be that CNs have a pivotal role in ICUs as they act as open communication channels between bedside nurses and other team members. One of the highlighted issues was that nurses tended to rate the collaboration and communication with each other and other team members as adequate only, while physicians tended to rate collaboration and communication higher with each other and others. In fact, physicians rated their collaboration and communication with nurses higher than nurses did among themselves.

On the other hand, other researches by Alayed et al. (2014) and Thomas et al. (2003) show that nurses rated the quality of collaboration and communication with other nurses as high or very high, while Thomas et al. (2003) and Aydon, Martin, and Nathan (2014) obtained similar results to this study, which indicated that physicians tended to rate collaboration and communication with nurses as high. The existence of these differences between nurses and physicians could be related to the professional status and qualifications of both groups. Lack of respect from some physicians contributed to the negative attitude of nurses towards communication and collaboration (Aydon et al., 2014).

A key finding of this study is the apparent gender-dependent rate of the collaboration and communication items, where male ratings were notably higher than those of female participants. To the researcher knowledge, there is no study in the literature highlighting the difference in the attitude of male and female healthcare professionals in critical care areas towards communication and collaboration. Given the importance of communication to achieve a safe environment for patients, further research in this topic may be fruitful. The differences could be mainly attributed

to cultural differences and language barriers (Almutairi et al., 2013; Chaboyer et al., 2013). Over 70% of female staff are from an Asian background. Therefore, those Asian staff may find it difficult to cope with the majority of people who speak Arabic as their original language, including with other healthcare members. It is not known whether the disrespect of some physicians towards nurses contributed to the negative attitude of female nurses.

5.4 Participants' recommendations to improve patient safety in the ICU

In response to open-ended questions, participants identified key areas for improvement in ICUs. Issues related to staffing levels, communication and teamwork skills and administration supports were highlighted as areas for further improvement along with previous reports in the literature (Alayed et al., 2014; Huang et al., 2007). Some of the main areas of concerns in these categories related to nurse-patient ratios, the need for teamwork skills, proper endorsement, improved communication with ICU managers, the need for administration support and more incentives. Noticeably, only one participant raised the issue of salary compensation, which means that participants may have concerns with other safety issues of greater importance such as teamwork and communication. Similar findings by Huang et al (2007) show that just a few participants raised the issues of salary, while the majority focused on safety issues such as staffing and teamwork. Moreover, participants in this study suggested other recommendations related to training and education and resources and guidelines, similar to the studies of Abdi et al. (2015) and Chaboyer et al. (2013).

5.5 Limitations

This study had some limitations. Firstly, convenience sampling was used. This type of sampling strategy is a self-selection one. Thus, participants who self-select may be irrelevant to the research study. Therefore, this method may lead to bias and could negatively impact the study

outcomes (De Vaus, 2014; Schneider & Fisher, 2013). To overcome this issue, identified characteristics of the representativeness of the sample should be addressed (De Vaus, 2014). In this study, the bias was minimised due to the representativeness of the sample, nurses, physicians and RTs from the two ICUs. Most participants were nurses and this reflects the nurse population in both sites. Also, to further minimise the bias, all participants were encouraged to join the study voluntarily and anonymously.

The second limitation was that the results are not generalisable due to the use of only two ICUs in Saudi Arabia. Therefore findings may not be applicable in other healthcare facilities. To improve the generalisability of study findings, further research on a large scale would be ideal. The research could also be conducted in different healthcare sectors globally, in order to provide good psychometric data for comparison.

The next limitation of this study is the responses from RTs. The majority of RT participants were originally nurses, and they were assigned in the respiratory units to cover staff shortages and bypass certain requirements of the accreditation agency. Thus, whilst they responded differently to nurses in some questions, their responses to the questionnaires may not reflect the overall safety culture of the registered RTs.

Finally, the results are based on self-reported questionnaires. Self-reporting does not always present accurate data. The main issue with this method is that some participants may respond to the questionnaire according to their social needs (social response bias), rather than give honest responses (Polit & Beck, 2010). The study aim was to examine the perception of participants towards patient safety. Therefore, self-reporting questionnaires were appropriate to increase the participation rate and maintain their anonymity. Also, to reduce bias responses by participants, positively and negatively worded items were included in the questionnaire (Polit & Beck, 2010).

5.6 Recommendations

Based on the findings of this study, recommendations to improve the attitude of healthcare professionals towards the six domains and the quality of collaboration and communication are the following:

5.6.1 Improve perception of management and working condition domains

- Staff-to-patient ratios must be adopted according to international standards. The European Society of Intensive Care Medicine from 23 countries identified recommendations according to basic requirements for ICUs (Valentin & Ferdinande, 2011). Nurse-to-patient-ratios can be calculated according to the level of care in the ICU. The first level (the lowest level of care) includes patients who experience signs of organ dysfunction, thus one nurse can manage three patients. The second level represents patients with one organ dysfunction and who require pharmacological and invasive procedures. These level two patients can be managed according to the ratio of one nurse to two patients. The third level is the highest, where patients present with two or more organ failures of a life-threatening character. In this level, one patient should be attended to by one nurse.

  Physicians, on the other hand, should be allocated in ICUs according to sets of criteria such as number of beds and shifts, occupancy rate and holidays. However, the recommended physician-to-patient ratio is one physicians per six to eight beds for level two patients. To calculate the exact number of physicians in ICUs, the formula provided by European working hours directives in Appendix I could be utilised (Valentin & Ferdinande, 2011).

5.6.2 Improve the job satisfaction domain

- Hospital administration should consider offering special incentives, such as career development opportunities, for those who choose to work in critical care areas.
- Staff should be allocated in critical areas according to their competency assessment, qualification and past experiences, not according to their nationality or preferences.
- Professional development programs should be offered regularly and fairly between all staff.

5.6.3 Improve teamwork climate, safety climate and stress recognition domains

- Educational program and training should be tailored to every specialty in ICUs. Leaders could consider one of the following programs depending on the needs, the TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety), which has been demonstrated to enhance teamwork, leadership and communication skills (Clancy & Tornberg, 2007) and the Anaesthetists' Non-Technical Skills. The latter focuses mainly on four skills which involve: team management, teamwork, situation awareness and decision making (Reader, Flin, Lauche, & Cuthbertson, 2006).
- There should be regular communication between staff and managers to obtain trust and encourage any feedback or suggestions which could be implemented in regular walk-rounds. It has been suggested that "executive walk-rounds" could improve healthcare professionals' perception of the safety climate (Huang et al., 2007).
- Hospitals in our study can assess patient safety in the ICU by developing or utilising existing list of criteria to identify any risks or hazards and implement strategies to reduce risk through comprehensive planning (Moreno et al., 2009).

5.6.4 Improve communication and collaboration

- Training on conflict resolution, sharing knowledge and opinions, collaborative rounds and listening skills would be possible actions to overcome the differences between healthcare groups and gender (Chaboyer et al., 2013).

5.7 Chapter summary

This chapter has addressed the findings of this study in relation to current literature. The study has several major findings. First, participants in Hospital A scored all domains higher than Hospital B and that was probably related to several factors such as staff ratio, bed capacity and the unit infrastructure. The second finding, the domain, perception of management, was rated the lowest among all domains which could be related to lack of communication between managers and staff. Participants in the two ICUs tended to rate some items in the job satisfaction domain positively with slight differences between both sites, thus job satisfaction domain was rated the highest from all domains. The third findings, in term of job categories, is that RTs felt more positive towards job satisfaction domains than other groups did which could be related to their qualifications and experiences. However, further research to explore this statement is essential. Furthermore, study results indicated that CNs had the highest rating among all professions in regards to communication and collaboration, emphasising the importance of their role in ICU. The higher attitude of physicians towards communication and collaboration between each other and with other team members could be related to their professional level and qualifications. Male participants tended to rate communication higher than females did which could be attributed to cultural and language issues. Finally, further recommendations to improve healthcare professional attitudes towards patient safety such as correcting staff ratio, administration support, staff

competency, providing education programs and improving communication and teamwork skills should be considered.

5.8 Conclusion

The descriptive cross-sectional design in two ICUs in Saudi Arabia using the SAQ-ICU revealed that healthcare professionals had negative attitudes towards patient safety according to six safety domains. The study showed different safety attitudes across the two ICUs. These differences suggest that ICU nurse managers should focus on issues related to teamwork, staffing, physical resources, educational programs, cultural competency and quality project programs.

One of the important findings is that low scores in the working conditions and perception of management domains should be addressed, as they are associated with negative patient outcomes. The job satisfaction domain was rated the highest among all domains, although the score was <75. Hospital A participants rated the stress recognition domain higher than Hospital B did. That could be associated with the hypothesis that there was a positive association between the years of experience in a specialty, age and stress recognition domains. The participants in Hospital A felt that they like their ICU and felt proud to work there, which suggested that nurses had a high morale in their ICU. In this study, only RTs felt positive in the job satisfaction domain. Nurses and leaders shared similar attitudes to patient safety. So too did physicians and nurses, and male and female participants.

Communication and collaboration among staff needs further and comprehensive improvement. Differences between professional groups and gender should be considered by providing certain programs to tailor each profession. In general, participants tended to rate their

communication with CNs, critical care residents, NM/HNs, nurses, RTs and intensivists high. The findings revealed that nurses rated communication and collaboration among themselves and others adequate, while physicians rated communication and collaboration high among themselves as well as others. The gender issue, on the other hand, showed that male participants rated communication and collaboration higher than female participants did.

The SAQ-ICU revealed several issues of patient safety in the two ICUs, therefore areas for improvement should be identified according to the findings. Recommendations to managers such as improving staff ratios, improving the presence of hospital administration in walk-rounds, improving healthcare professionals' skills and knowledge, and improving communication and collaboration skills should be initiated.

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Appendix A

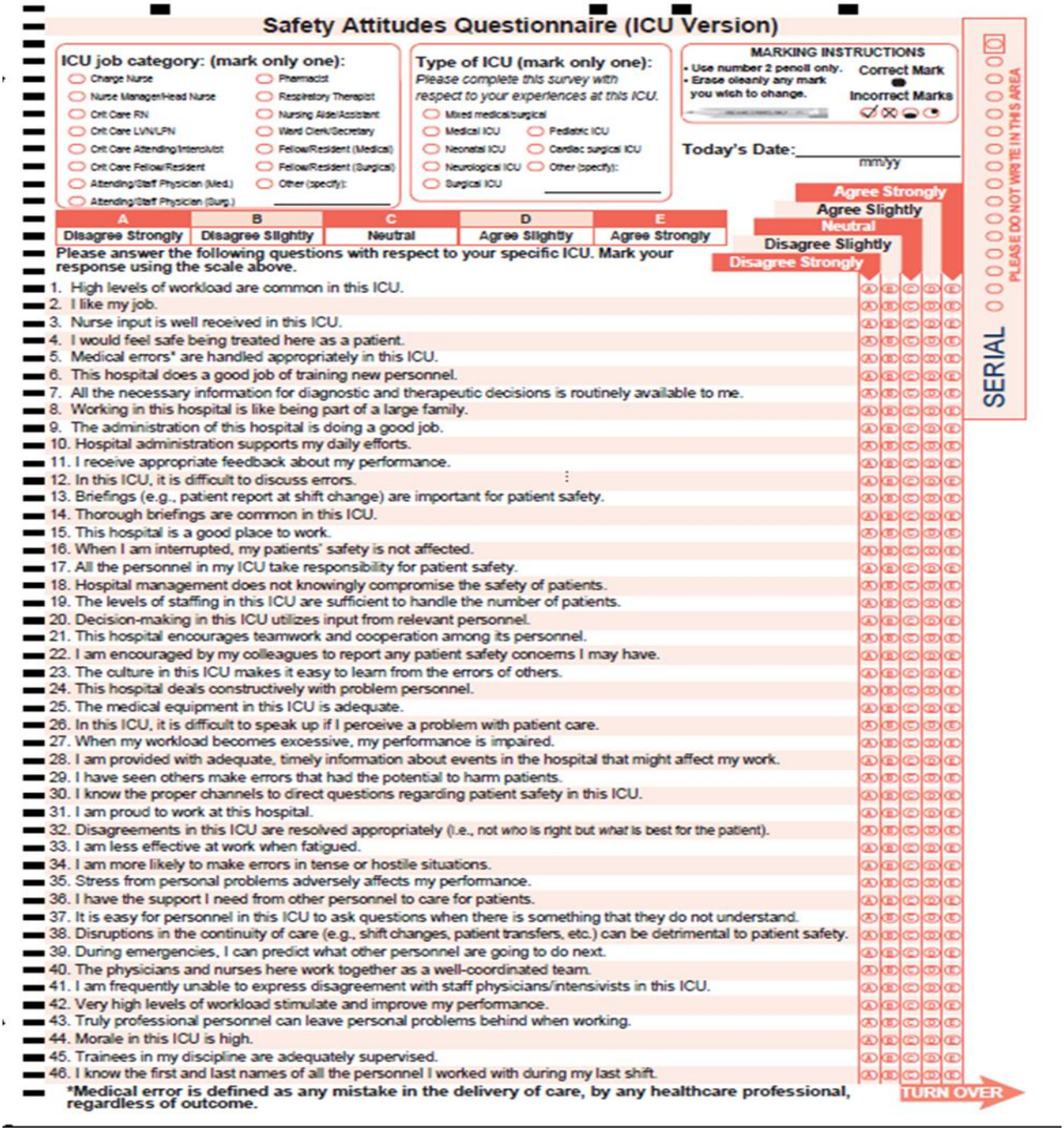
Overview of critical care services at three different hospitals from the central region of Saudi Arabia

Variable	RAAH	WADH	KAMC
Level	Primary	Secondary	Tertiary
Beds capacity	30	96	800
Type of ICU/ICU beds	General (2beds)	General (5beds)	Medical-surgical ICU (21 beds)
Medical Director	None	Part-time; not certified as Critical Care	Full-time, critical-care-certified
Medical staffing	No special ICU staff	3 intensivists	10 full-time, critical-care-certified consultants
Certified in ICU (%)	0	0	100
Coverage type	Open unit	Open unit	Closed unit
No. of critical care nurses	3	6	102
ICU-specific Nursing Training	1 month ICU Training	ICU experience	70% critical-care-certified; 30% with minimum of 2 years of ICU experiences
Respiratory therapy	None	None	Established Respiratory Care Department
No. of Ventilators	2	6	100
Daytime cover	Primary doctors	ICU doctors	24-hour coverage on site
Night time & weekend shift	On-call registrar	Off-site	Consultant; residents and fellows and on-call

Adapted from (Arabi & Al Shimemeri, 2006).

Appendix B

Safety Attitude Questionnaire



Safety Attitudes Questionnaire (ICU Version)

ICU job category: (mark only one):

- Charge Nurse
- Nurse Manager/Head Nurse
- Crit Care RN
- Crit Care LVN/LPN
- Crit Care Attending/Intensivist
- Crit Care Fellow/Resident
- Attending/Staff Physician (Med.)
- Attending/Staff Physician (Surg.)
- Pharmacist
- Respiratory Therapist
- Nursing Aide/Assistant
- Ward Clerk/Secretary
- Fellow/Resident (Medical)
- Fellow/Resident (Surgical)
- Other (specify): _____

Type of ICU (mark only one):

Please complete this survey with respect to your experiences at this ICU.

- Mixed medical/surgical
- Medical ICU
- Pediatric ICU
- Neonatal ICU
- Cardiac surgical ICU
- Neurological ICU
- Other (specify): _____
- Surgical ICU

MARKING INSTRUCTIONS

- Use number 2 pencil only.
- Erase cleanly any mark you wish to change.

Correct Mark ●

Incorrect Marks ✓ ⊗ ◒ ◔

Today's Date: _____ mm/yy

A	B	C	D	E
Disagree Strongly	Disagree Slightly	Neutral	Agree Slightly	Agree Strongly

Agree Strongly / Agree Slightly / Neutral / Disagree Slightly / Disagree Strongly

Please answer the following questions with respect to your specific ICU. Mark your response using the scale above.

1. High levels of workload are common in this ICU.
2. I like my job.
3. Nurse input is well received in this ICU.
4. I would feel safe being treated here as a patient.
5. Medical errors* are handled appropriately in this ICU.
6. This hospital does a good job of training new personnel.
7. All the necessary information for diagnostic and therapeutic decisions is routinely available to me.
8. Working in this hospital is like being part of a large family.
9. The administration of this hospital is doing a good job.
10. Hospital administration supports my daily efforts.
11. I receive appropriate feedback about my performance.
12. In this ICU, it is difficult to discuss errors.
13. Briefings (e.g., patient report at shift change) are important for patient safety.
14. Thorough briefings are common in this ICU.
15. This hospital is a good place to work.
16. When I am interrupted, my patients' safety is not affected.
17. All the personnel in my ICU take responsibility for patient safety.
18. Hospital management does not knowingly compromise the safety of patients.
19. The levels of staffing in this ICU are sufficient to handle the number of patients.
20. Decision-making in this ICU utilizes input from relevant personnel.
21. This hospital encourages teamwork and cooperation among its personnel.
22. I am encouraged by my colleagues to report any patient safety concerns I may have.
23. The culture in this ICU makes it easy to learn from the errors of others.
24. This hospital deals constructively with problem personnel.
25. The medical equipment in this ICU is adequate.
26. In this ICU, it is difficult to speak up if I perceive a problem with patient care.
27. When my workload becomes excessive, my performance is impaired.
28. I am provided with adequate, timely information about events in the hospital that might affect my work.
29. I have seen others make errors that had the potential to harm patients.
30. I know the proper channels to direct questions regarding patient safety in this ICU.
31. I am proud to work at this hospital.
32. Disagreements in this ICU are resolved appropriately (i.e., not *who* is right but *what* is best for the patient).
33. I am less effective at work when fatigued.
34. I am more likely to make errors in tense or hostile situations.
35. Stress from personal problems adversely affects my performance.
36. I have the support I need from other personnel to care for patients.
37. It is easy for personnel in this ICU to ask questions when there is something that they do not understand.
38. Disruptions in the continuity of care (e.g., shift changes, patient transfers, etc.) can be detrimental to patient safety.
39. During emergencies, I can predict what other personnel are going to do next.
40. The physicians and nurses here work together as a well-coordinated team.
41. I am frequently unable to express disagreement with staff physicians/intensivists in this ICU.
42. Very high levels of workload stimulate and improve my performance.
43. Truly professional personnel can leave personal problems behind when working.
44. Morale in this ICU is high.
45. Trainees in my discipline are adequately supervised.
46. I know the first and last names of all the personnel I worked with during my last shift.

*Medical error is defined as any mistake in the delivery of care, by any healthcare professional, regardless of outcome.

SERIAL 0000000000000000 PLEASE DO NOT WRITE IN THIS AREA

TURN OVER

Please answer by marking the response of your choice to the right of each item, using the letter from the scale below.

A	B	C	D	E
Disagree Strongly	Disagree Slightly	Neutral	Agree Slightly	Agree Strongly

47. I have made errors that had the potential to harm patients.
48. Staff physicians/intensivists in this ICU are doing a good job.
49. Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).
50. Fatigue impairs my performance during routine care (e.g., medication review, ventilator checks, transfer orders).
51. If necessary, I know how to report errors that happen in this ICU.
52. Patient safety is constantly reinforced as the priority in this ICU.
53. Interactions in this ICU are collegial, rather than hierarchical.
54. Important issues are well communicated at shift changes.
55. There is widespread adherence to clinical guidelines and evidence-based criteria in this ICU.
56. Personnel are not punished for errors reported through incident reports.
57. Error reporting is rewarded in this ICU.
58. Information obtained through incident reports is used to make patient care safer in this ICU.
59. During emergency situations (e.g., emergency resuscitations), my performance is not affected by working with inexperienced or less capable personnel.
60. Personnel frequently disregard rules or guidelines (e.g., handwashing, treatment protocols/clinical pathways, sterile field, etc.) that are established for this ICU.
61. Communication breakdowns which lead to delays in delivery of care are common.
62. Communication breakdowns which negatively affect patient care are common.
63. A confidential reporting system that documents medical incidents is helpful for improving patient safety.
64. I may hesitate to use a reporting system for medical incidents because I am concerned about being identified.
65. Have you completed this survey before? ○ yes ○ no ○ don't know

Use the scales to describe the *quality of collaboration and communication* you have experienced with:

Very Low	Low	Adequate	High	Very High	Not Applicable

- Charge Nurse
- Nurse Manager/Head Nurse
- Crit Care RN
- Crit Care LVN/LPN
- Crit Care Attending/Intensivist
- Crit Care Fellow/Resident
- Attending/Staff Physician (Medical)
- Attending/Staff Physician (Surgical)
- Pharmacist
- Respiratory Therapist
- Nursing Aide/Assistant
- Ward Clerk/Secretary
- Fellow/Resident (Medical)
- Fellow/Resident (Surgical)
- Other (specify):_____

BACKGROUND INFORMATION

Gender: ○ Male ○ Female

ICU Job Status
- ○ Full-time
- ○ Part-time
- ○ Agency
- ○ Contract

Ethnic Group:
- ○ Hispanic
- ○ Black (not Hispanic)
- ○ White (not Hispanic)
- ○ Asian/Pacific Islander
- ○ Multi-ethnic
- ○ Other:_____

"Optional" collected as part of a cross-cultural study
Citizenship (e.g., Canadian, Filipino, USA, etc.):
_____
Country of birth (if different):_____

Usual Shift
- ○ Days
- ○ Evenings
- ○ Nights
- ○ Variable Shifts

How many years of experience do you have in this primary specialty? YEARS

How many years have you worked in this ICU (mark 00 if less than 1 year)? YEARS

CURRENT AGE YEARS

For *Attending* Physicians

On average, how many patients do you admit to this ICU each month?

COMMENTS: What are your top three recommendations for improving patient safety in this ICU?

1. _____
2. _____
3. _____

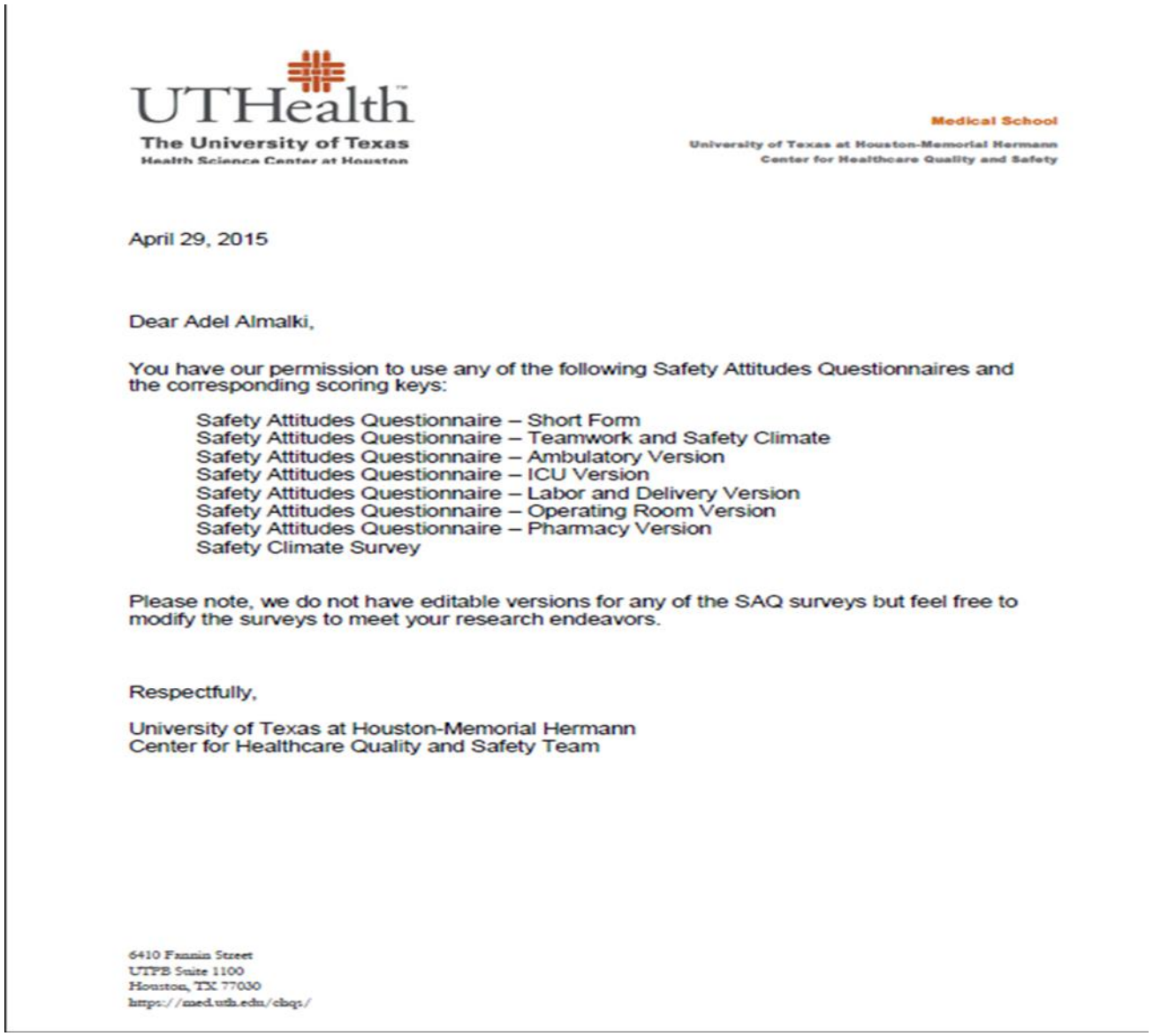
If more room for comments is needed, please provide your response on a separate sheet of paper.

Thank you for completing the questionnaire - Your time and participation are greatly appreciated

Printed in U.S.A. Mark Reflex® forms by Pearson NCS MW236252-4 654321 ED09

Appendix C

Permission to use the SAQ-ICU from the University of Texas



UTHealth
The University of Texas
Health Science Center at Houston

Medical School
University of Texas at Houston-Memorial Hermann
Center for Healthcare Quality and Safety

April 29, 2015

Dear Adel Almalki,

You have our permission to use any of the following Safety Attitudes Questionnaires and the corresponding scoring keys:

Safety Attitudes Questionnaire – Short Form
Safety Attitudes Questionnaire – Teamwork and Safety Climate
Safety Attitudes Questionnaire – Ambulatory Version
Safety Attitudes Questionnaire – ICU Version
Safety Attitudes Questionnaire – Labor and Delivery Version
Safety Attitudes Questionnaire – Operating Room Version
Safety Attitudes Questionnaire – Pharmacy Version
Safety Climate Survey

Please note, we do not have editable versions for any of the SAQ surveys but feel free to modify the surveys to meet your research endeavors.

Respectfully,

University of Texas at Houston-Memorial Hermann
Center for Healthcare Quality and Safety Team

6410 Fannin Street
UTPB Suite 1100
Houston, TX 77030
https://med.uth.edu/chqs/

Appendix D

Hospital A Ethics Committee Approval

KINGDOM OF SAUDI ARABIA
General Directorate for Health Affairs
Makah Almukaramah Region

المملكة العربية السعودية
المديرية العامة للشئون الصحية بمنطقة مكة المكرمة

وزارة الصحة
Ministry of Health

- It is allowed ONLY to access and keep this document with its owner and to whom it is applicable.
- It is NOT allowed to photocopy – in part or as a whole, and if needed, request it from its owner to have a copy

Research Committee Decision

Committee Use Only

☑ Approved ☐ Not Approved

Project Title:	Patient Safety issues in FCUs in K.S.A Health Professionals perspective
Researcher's Name:	MR. Adel Ali K ALMalki
Workplace:	
Telephone:	Home: [redacted] Mobile [redacted]
E-mail:	[redacted]

Dear researcher, according to our policy (TR-P&P-11) an approval of your research titled above was granted by the Medical Ethics and Research Committee. Could you come to the research department to complete all other required documents please.

Medical Ethics and Research Committee Coordinator

Dr. Bader Al Harthi [redacted]

[redacted]

Code TR-FO-P&P11 -02 Issue No :1 Issue Date: 15/07/1434 Activation Date:: 01/08/1434 Revision Date:: 01/08/1436 Copy No 1 Page No:1 / 1

Appendix E

Hospital B Ethics Committee Approval

وزارة الصحة
Ministry of Health

RESEARCH ETHICS COMMITTEE

30 June 2015
14 Shawwal 1436 H

Adel Ali AlMalki
Monash University,
Melbourne – Australia

Research Title: **Patient safety in Intensive care Units in Saudi Arabia**

Application Number: **REC 2015-19**

We would like to inform you that your research application has been reviewed and found to be in compliance with the Hospital research policy and procedures, and your study has been approved to be conducted in

DR. HISHAM ALQURASHI
[redacted]
Hospital Program Director

Chairman of Research Ethics Committee

Appendix F

Monash University Ethics Approval

MONASH University
Monash University Human Research Ethics Committee (MUHREC)
Research Office

Human Ethics Certificate of Approval

This is to certify that the project below was considered by the Monash University Human Research Ethics Committee. The Committee was satisfied that the proposal meets the requirements of the *National Statement on Ethical Conduct in Human Research* and has granted approval.

Project Number:	CF15/3671 - 2015001592
Project Title:	Patient Safety Issues in Intensive Care Units in Saudi Arabia. Health Professionals Perspective: A Descriptive Study.
Chief Investigator:	Ms Kelli Innes
Approved:	**From:** 21 October 2015 **To:** 21 October 2020

Terms of approval - ***Failure to comply with the terms below is in breach of your approval and the Australian Code for the Responsible Conduct of Research.***

1. The Chief investigator is responsible for ensuring that permission letters are obtained, if relevant, before any data collection can occur at the specified organisation.
2. Approval is only valid whilst you hold a position at Monash University.
3. It is the responsibility of the Chief investigator to ensure that all investigators are aware of the terms of approval and to ensure the project is conducted as approved by MUHREC.
4. You should notify MUHREC immediately of any serious or unexpected adverse effects on participants or unforeseen events affecting the ethical acceptability of the project.
5. The Explanatory Statement must be on Monash University letterhead and the Monash University complaints clause must include your project number.
6. **Amendments to the approved project (including changes in personnel):** Require the submission of a Request for Amendment form to MUHREC and must not begin without written approval from MUHREC. Substantial variations may require a new application.
7. **Future correspondence:** Please quote the project number and project title above in any further correspondence.
8. **Annual reports:** Continued approval of this project is dependent on the submission of an Annual Report. This is determined by the date of your letter of approval.
9. **Final report:** A Final Report should be provided at the conclusion of the project. MUHREC should be notified if the project is discontinued before the expected date of completion.
10. **Monitoring:** Projects may be subject to an audit or any other form of monitoring by MUHREC at any time.
11. **Retention and storage of data:** The Chief Investigator is responsible for the storage and retention of original data pertaining to a project for a minimum period of five years.

[redacted]

Professor Nip Thomson
Chair, MUHREC

cc: Prof Ruth Endacott, Mr Adel Ali K Al Malki

Monash University, Room 111, Chancellery Building E
24 Sports Walk, Clayton Campus, Wellington Rd
Clayton VIC 3800, Australia
Telephone: +61 3 9905 5490 Facsimile: +61 3 9905 3831
Email: muhrec@monash.edu http://intranet.monash.edu.au/researchadmin/human/index.php
ABN 12 377 614 012 CRICOS Provider #00008C

Appendix G

Explanatory Statement

(Healthcare Professionals in ICU)

Project: **Patient Safety Issues in Intensive Care Units in Saudi Arabia. Health Professionals Perspective: A Descriptive Study.**

Principal Researcher	Associate Researchers
Kelli Innes Monash University Australia. Faculty of Medicine, Nursing and Health Science. MN (Emergency), Grad Cert Health Professional Education, RN Lecturer, BN Course Coordinator, [redacted]	**Prof Ruth Endacott** Monash University Australia. Faculty of Medicine, Nursing and Health Science. PhD, MA, DipN (London), RN [redacted]
	Adel Ali K Al Malki BSN, RN, (Master of Nursing) Disaster and Emergency Nursing Management student – Monash University Australia, Faculty of Medicine, Nursing and Health Science. [redacted]

You are invited to take part in this study. Please read this Explanatory Statement in full before deciding whether or not to participate in this research. If you would like further information regarding any aspect of this project, you are encouraged to contact the researchers via the phone number or email address listed above.

What does the research involve?

The aim of the study is to explore the common safety issues for ICU patients in two major hospitals in Taif, Saudi Arabia, from the perspective of health care professionals. You will be required to complete the Safety Attitude Questionnaire (SAQ-ICU version). The questionnaire will require approximately 10-15 minutes of your time to complete.

Why were you chosen for this research?

All nurses, physicians and respiratory therapists in ICUs who meet the following inclusion criteria will be invited to complete the questionnaire: ability to read and understand English and have 3 months and above experience in the ICU. If you have less than 3 months experience in ICU, your survey will be excluded as you are still in the probationary period.

Consenting to participate in the project and withdrawing from the research

By returning the completed questionnaire, it will be considered implied consent to agree to participate. No written consent is required. It will not be possible to identify staff members who participate in the study. Participation is voluntary and, if you proceed, it will be impossible to withdraw your completed response as the questionnaires have no identifiable coding.

Possible benefits and risks to participants

The research findings may increase the awareness of patient safety issues from the health care professional's perspective in ICUs, contributing to safety while in the ICU. As the questionnaire will take from 10-15 minutes to complete by participants, there is minimal risk of discomfort.

Confidentiality

The research data gathered for the study may be published but you and your data will not be identifiable.

Storage of data

All data will be stored securely in a personal computer with password. However, all completed questionnaires will be stored in a safe and secure lacked cabinet in a secure facility in Monash University and according to Monash University guidelines. Only the researcher's supervisor (if applicable) and the researcher will have access to the data. After five years, all data will be destroyed if no longer required in a shredder in secure waste.

Results

The results of the research will be presented in the thesis, at a conference and via peer reviewed journal. A copy from the findings will be sent to participant's locations if approval obtained from Monash University.

Complaints

Should you have any concerns or complaints about the conduct of the project, you can contact one of the principle researchers on the above contact details.

Any other issues related to any aspect of the project, or if you feel your rights have been violated, then you may contact:

Executive Officer
Monash University Human Research Ethics Committee (MUHREC)
Room 111, Building 3e
Research Office
Monash University VIC 3800

[redacted]

Thank you,

Student Researcher;

Adel Ali K Al Malki

Appendix H

Safety attitude questionnaire items with mean, SD, responses rate, percentage of positive scores (>75)

	Items	Mean (SD)	% Total Responses	% + ve responses (score > 75)
1	high level of workload are common in this ICU	93.58 (15.29)	100.0	95.8
2	I like my job	86.98 (21.92)	100.0	84.7
3	Nurse input is well received in this ICU	70.80 (22.40)	99.3	63.9
4	I would feel safe being treated here as a patient	63.72 (24.53)	100.0	51.4
5	medical errors are handled appropriately in this ICU	68.06 (24.99)	100.0	57.6
6	this hospital does a good job for training new personnel	55.03 (32.60)	100.0	47.2
7	all the necessary information for diagnostic and therapeutic decision is routinely available to me	66.67 (23.09)	100.0	66.7
8	Working in this hospital is like being part of a large family.	57.99 (29.81)	100.0	48.6
9	The administration of this hospital is doing a good job.	41.32 (30.20)	100.0	27.8
10	Hospital administration supports my daily efforts.	35.94 (29.67)	100.0	20.8
11	I receive appropriate feedback about my performance.	44.62 (29.88)	100.0	27.1
12	In this ICU, it is difficult to discuss errors.	53.12 (27.56)	100.0	38.2
13	Briefings (e.g., patient report at shift change) are important for patient safety.	84.03 (19.97)	100.0	84.0
14	Thorough briefings are common in this ICU.	70.83 (26.11)	100.0	64.6
15	This hospital is a good place to work.	60.07 (29.61)	100.0	53.5
16	When I am interrupted, my patients' safety is not affected.	62.06 (32.75)	99.3	58.3
17	All the personnel in my ICU take responsibility for patient safety.	68.58 (27.06)	100.0	61.1
18	Hospital management does not knowingly compromise the safety of patients.	55.42 (28.48)	99.3	39.6
19	The levels of staffing in this ICU are sufficient to handle the number of patients.	35.99 (33.86)	97.9	27.1
20	Decision-making in this ICU utilizes input from relevant personnel.	60.76 (25.72)	100.0	50.0
21	This hospital encourages teamwork and cooperation among its personnel.	59.03 (28.76)	100.0	54.2

22	I am encouraged by my colleagues to report any patient safety concerns I may have	67.71 (22.88)	100.0	66.7
23	The culture in this ICU makes it easy to learn from the errors of others.	57.29 (27.71)	100.0	41.7
24	This hospital deals constructively with problem personnel.	56.08 (26.65)	100.0	43.1
25	The medical equipment in this ICU is adequate.	59.20 (28.32)	100.0	53.5
26	In this ICU, it is difficult to speak up if I perceive a problem with patient care.	53.32 (28.49)	99.3	41.7
27	When my workload becomes excessive, my performance is impaired.	71.53 (28.14)	100.0	64.9
28	I am provided with adequate, timely information about events in the hospital that might affect my work.	60.66 (24.65)	99.3	47.9
29	I have seen others make errors that had the potential to harm patients.	59.37 (32.37)	100.0	49.3
30	I know the proper channels to direct questions regarding patient safety in this ICU.	70.14 (27.78)	100.0	66.7
31	I am proud to work at this hospital.	73.44 (27.45)	100.0	73.6
32	Disagreements in this ICU are resolved appropriately (i.e., not who is right but what is best for the patient).	61.71 (27.55)	99.3	56.3
33	I am less effective at work when fatigued.	63.89 (32.09)	100.0	58.3
34	I am more likely to make errors in tense or hostile situations.	57.29 (34.59)	100.0	45.8
35	Stress from personal problems adversely affects my performance.	46.50 (34.17)	99.3	38.2
36	I have the support I need from other personnel to care for patients.	68.06 (24.81)	100.0	63.9
37	It is easy for personnel in this ICU to ask questions when there is something that they do not understand.	73.43 (21.02)	99.3	77.1
38	Disruptions in the continuity of care can be detrimental to patient safety.	69.23 (30.39)	99.3	61.8
39	During emergencies, I can predict what other personnel are going to do next.	73.09 (23.67)	100.0	72.2
40	The physicians and nurses here work together as a well-coordinated team.	62.15 (28.20)	100.0	53.5
41	I am frequently unable to express disagreement with staff physicians/intensivists in this ICU.	48.61 (27.06)	100.0	27.8
42	Very high levels of workload stimulate and improve my performance.	49.65 (33.32)	100.0	37.5
43	Truly professional personnel can leave personal problems behind when working.	79.17 (25.60)	100.0	77.1
44	Morale in this ICU is high.	73.43 (24.32)	99.3	68.1
45	Trainees in my discipline are adequately supervised.	56.42 (29.23)	100.0	48.6
46	I know the first and last names of all the personnel I worked with during my last shift.	72.92 (26.53)	100.0	75.0
47	I have made errors that had the potential to harm patients.	18.92 (28.09)	100.0	10.4
48	Staff physicians/intensivists in this ICU are doing a good job.	74.31 (19.82)	100.0	73.6
49	Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).	50.35 (32.92)	100.0	50.0

50	Fatigue impairs my performance during routine care (e.g., medication review, ventilator checks, transfer orders).	42.19 (31.36)	100.0	32.6
51	If necessary, I know how to report errors that happen in this ICU.	79.17 (22.52)	100.0	79.2
52	Patient safety is constantly reinforced as the priority in this ICU.	80.03 (23.20)	100.0	79.9
53	Interaction in this ICU are collegial, rather than hierarchical.	63.29 (24.52)	99.3	56.3
54	Important issues are well communicated at shift changes.	76.57 (25.30)	99.3	74.3
55	There is widespread adherence to clinical guidelines and evidence-based criteria in this ICU.	63.11 (26.75)	99.3	45.8
56	Personnel are not punished for errors reported through incident reports.	54.69 (31.00)	100.0	41.7
57	Error reporting is rewarded in this ICU.	36.36 (31.53)	99.3	23.6
58	Information obtained through incident reports is used to make patient care safer in this ICU.	72.22 (23.49)	100.0	77.1
59	During emergency situations my performance is not affected by working with inexperienced or less capable personnel.	53.32 (29.30)	99.3	41.7
60	Personnel frequently disregard rules or guidelines that are established for this ICU.	47.73 (30.14)	99.3	34.0
61	Communication breakdowns which lead to delays in delivery of care are common.	48.43 (27.29)	99.3	27.1
62	Communication breakdowns which negatively affect patient care are common.	49.65 (31.01)	99.3	34.7
63	A confidential reporting system that documents medical incidents is helpful for improving patient safety.	72.92 (28.74)	100.0	70.1
64	I may hesitate to use a reporting system for medical incidents because I am concerned about being identified	54.65 (37.23)	97.2	40.3
	Total	**60.79 (7.26)**	**99.7**	**53.5**

Appendix I

Calculation of physician manpower

$$\frac{\text{Needed manpower time (hrs)}^{1} \times 365 \text{ days}}{\text{Net working time per FTE (hrs)}^{2} \text{ per year}} = \text{number of FTEs}$$

(FTEs)= full time equivalent

Example:

The example refers to a 6-8 bed ICU carrying mainly for patients requiring a level of care II.

(1) Needed manpower time per day (hrs):

24 hrs coverage
+1 5 hrs as handover time
+8 hrs for extra-intensivist during morning session
= total of 33.5 hrs per day

Needed manpower time per year = 33.5 hrs x 365 = 12227.5 hrs

(2) Net working time (hrs) per FTE per year:

Total working time = hours per week (eg 40 hrs x 52 weeks) =		2080 hrs)
Holiday leaves	(eg 30 days x 8 hrs) =	-240 hrs)
Study leave	(eg 10 days x 8 hr =	-80 hrs)
Sick leave	(eg 5 days x 8 hrs) =	-40 hrs)
Net remaining working time/FTE/year =		1720 hrs)

Medical manpower calculation in this example= 12227.5 hrs /1720 hrs = 7.1 FTEs

Adapted from (Valentin & Ferdinande, 2011).