Towards a multidimensional approach to measure quality and safety of care in maternity units in Oman

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Abstract

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Thesis title: Towards a multidimensional approach to measure quality and safety of care in maternity units in Oman

Keywords: Quality, patient safety, maternity, Oman, hospitals, safety culture, maternal satisfaction, caesarean section.

Improving the quality and safety of maternity services is an international top agenda item. This thesis describes the progress towards the development of a multidimensional approach to measure the quality and safety of care in ten maternity units in Oman based on three of the five dimensional Patient Safety Measurement and Monitoring Framework (PSMMF) which include measuring "past harm" and "anticipation and preparedness".

The three monitoring approaches used in this research are: (1) measuring the patient safety culture (2) measuring patient satisfaction (3) and monitoring caesarean section rates.

The specific objectives of the research are to (1) measure patient safety culture level, (2) examine the association between nurse's nationality and patient safety culture, (3) validate an Arabic language survey to measure maternal satisfaction about the childbearing experience, (4) measure patient satisfaction about the childbearing experience, and (5) to examine caesarean section rates across maternity units using statistical process control charts.

This thesis started with four systematic reviews that focused on (1) the use of patient safety culture for monitoring maternity units (2) the available interventions to improve patient safety culture (3) Arabic surveys available for measuring maternal satisfaction and (4) the use of statistical process control charts for monitoring performance indicators. The overall conclusion from these reviews that these approaches are being increasingly used in maternity, found feasible and useful, and there are areas that need attention for future work. Five field studies were conducted to address the research aim and objectives.

Patient safety culture was measured by a cross-sectional survey of all staff in the ten maternity units. It was found that safety culture in Oman is below the target level and that there is wide variation in the safety scores across hospitals and across different categories of staff.

Non-Omani nurses have a more positive perception of patient safety culture than Omani nurses in all domains except in respect of stress recognition and this difference need further investigation and needs to be considered by designers of interventions to enhance patient safety culture.

Using two existing validated English surveys, an Arabic survey was developed, validated, and used to measure maternal satisfaction with childbirth services. It was found that the new survey has good psychometric properties and that in all the ten hospitals, mothers were satisfied with the care provided during child delivery but satisfaction score varied across hospitals and groups of participants.

Caesarean section rate in the last 17 years was examined using statistical process control charts to understand the variation across the ten hospitals. It was found that caesarean section rate is above the rate recommended by the World Health Organisation. Special cause variations were detected that warrant further investigation.

In conclusion, the field studies demonstrated that it is feasible to use the three approaches to monitor quality and safety in maternity units. However, further work is required to use these data to enhance the quality and safety of care. Additionally, future work is needed to cover the other three dimensions of the PSMMF.

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List of contents

List of tables

List of Figures

List of Appendices

Abbreviations

AHR	Annual Health Report
CUSUM	Cumulative Sum
HSOPSC	Hospital Survey on Patient Safety Culture
LCL	Lower Control Limit
MCU	Maternity Care Units
MMR	Maternal Mortality Ratio
MoH	Ministry of Health
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
PSC	Patient Safety Culture
PSMMF	Patient Safety Measurement and Monitoring Framework
SAQ	Safety Attitude Questionnaire
SD	Standard Deviation
SPC	Statistical Process Control
UCL	Upper Control Limit
WHO	World Health Organisation

List of publications related to this thesis

Published/accepted papers

Al Nadabi, W., McIntosh, B., McClelland, T. and Mohammed, M. (2019) Patient safety culture in maternity units: a review. International Journal of Health Care Quality Assurance 32 (4) 662-676

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Al Nadabi, W., Faisal, M., Mohammed A.M. (2019) 'Patient safety culture in maternity units in Oman'. Journal of evaluation in clinical practice

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Al Nadabi, W., Faisal, M., Mohammed A.M. (2018), 'The use of control chart to examine variation in safety culture in Oman', *International Saudi Health Informatics Conference*, Riyadh, Saudi Arabia

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1. Chapter one: An Overall Introduction

Improving maternity services remains a top priority for the United Nations (UN 2015). Although challenging, evidence shows that quality improvement in maternity units is possible. An essential step in the journey of quality improvement is to establish a measurement system that can help monitor current performance and the success or otherwise of improvement efforts (Draycott et al. 2010). Since quality and safety of maternity care is a complex multi-dimensional construct, multiple approaches are required to measure the quality and safety of care. Examples of such approaches or dimensions include patient safety culture, performance indicators, patient satisfaction, and incident reports. This thesis describes the initial progress in developing a multi-dimensional measurement system focusing on patient safety culture, maternal satisfaction, and caesarean section rates in ten maternity units in Oman.

1.1. Thesis structure and layout

This thesis contains 12 chapters as outlined in Figure 1.1. The introduction chapter, this chapter, describes the background, context and rationale for the study, followed by the overall aim and objectives of the study.

The following four chapters (i.e. chapters 2, 3, 4, and 5) are literature reviews that were systematically conducted to examine the application of different ways of measuring quality and safety in maternity care. Each of the review chapters starts with an abstract and contains its own introduction, methodology, findings, discussion, and conclusion. Chapter 2 reviewed the studies that have measured patient safety culture in maternity units. Chapter 3 reviewed the interventions that have been used to improve safety culture in maternity care. Chapter 4 examined Arabic surveys that have been used to measure maternal satisfaction in the Arab countries. Chapter 5 considered the use of indicators

derived from routinely collected data and the use of statistical process control methods to analyse performance indicators in maternity care.

Informed by the findings from the literature reviews, chapter 6 is the methodology chapter which describes the philosophical approach that was adopted. Additionally, it describes the pilot study that was conducted in one maternity unit before expanding the study to the other units. The methods used are outlined in the methodology chapter, but a detailed description of the methodology for each study is provided separately in the relevant chapters (study chapters).

The field studies conducted as part of this research are described in chapters 7, 8, 9, 10, and 11. Each of the study chapters has an introduction and a background, followed by the study-specific objectives, the methods, the results, and ending with the discussion and conclusion. Chapter 7 describes the study conducted to measure patient safety culture level in maternity units. Chapter 8 examines the association between nationality of nurses and patient safety culture. Chapter 9 describes the validation process of an Arabic survey that was used to examine maternal satisfaction. Chapter 10 examines maternal satisfaction level about childbearing services. Chapter 11 presents the use of statistical process control theory to examine caesarean section rates over the last few years. Chapter 12 is an overall discussion that summarises the work done, future work and limitations of the studies.

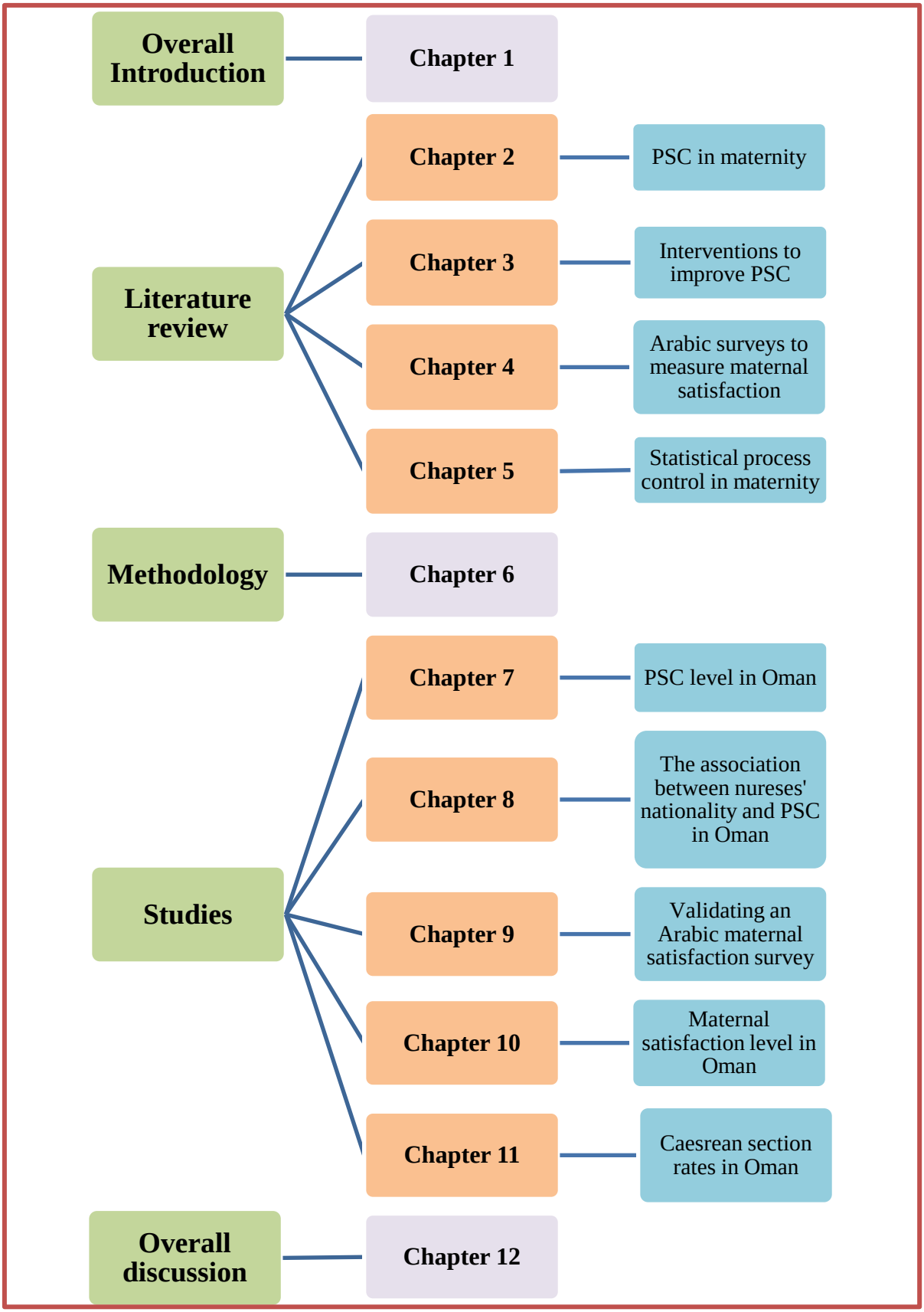

Figure 1.1: Thesis outline. **PSC:** *Patient Safety Culture*

1.2. Background and Rationale for the study

1.2.1. Background

The Sultanate of Oman is an Arab Gulf country located in the southeastern corner of the Arabian Peninsula. It is administratively divided into 11 Governorates. These Governorates are: Muscat (the capital), Dhofar, Musandam, Al Buraymi, Ad Dakhliyah, Al Batinah North, Al Batinah South, Ash Sharqiyah South, As Sharqiyah North, Adh Dhahirah and Al Wusta. The total population increased from 2,091,420 in 1995 to 4,559,963 in 2017. Life expectancy increased from 67.4 in 1995 to 76.9 in 2017. While the crude birth rate per 1000 population stayed around 33, the crude death rate for every 1000 population decreased from 6.1 in 1995 to 2.9 in 2017. The life expectancy increased to 76.9 in 2017 from 67.4 in 1995 (MoH 2017).

In addition to the Ministry of Health (MoH) being the primary provider, health services in Oman are provided by several sectors including Royal Oman Police, Petroleum development Oman, Sultan Qaboos University Hospital and medical services of Diwan of Royal Court. In addition, there are 21 private hospitals as well as other private clinics and private pharmacies. The government of Oman is committed to free access to health care. The government finances about 81% of the total health expenditure which represents 6.2% of the total government expenditure as in 2010. In 2017, the total health expenditure of MoH was 789.35 million Omani Rial (OMR) (=2050.26 million USD).The recurrent expenditure has increased from 156.3 million OMR in 2005 to 768.7 million OMR in 2017. The number of human resources for every 10000 population has increased from 9 (1990) to 20 (2017) for doctors and nurses (26 vs 43.7) (MoH 2017).

The ministry of health provides health care services through hospitals and health care centres. Hospitals are further divided into Governorate hospitals, Wilayat hospitals and

local hospitals. Governorate hospitals mostly provide secondary care services with some tertiary care to all inhabitants of that Governorate except for hospitals in Muscat where they act as national referral hospitals providing services to the whole country (MoH 2015a).

Maternity care services are provided through different levels of care services. A number of maternity services are provided in the health centres like birth spacing, vaccinations, routine follow-ups and counselling. While some health care centres have facilities for child delivery, the majority of deliveries and services are provided by the Governorate hospitals (MoH 2015a).

1.2.2. The rationale for the study

Internationally, improving the quality and safety of maternity care services continues to be a priority throughout the Millennium Development Goals and the Sustainable Development Goals (UN 2015). Nationally, there are five national priorities taken by the MoH in Oman according to the 2017 annual report. The development of maternal health and reducing childhood morbidity/mortality was third in the priority list showing a high commitment level to improve the quality and safety of services related to the mothers and their babies (MoH 2015a). Even before the establishment of a comprehensive maternity care program in 1987, improving maternal and child services was identified as a priority (MoH 2015b)

Despite the improvements made to maternity and child services in Oman, there is room for further improvements (MoH 2014). The rationale for conducting this research project in maternity care services can be realised by reviewing some of the health indicators related to maternity care in MoH institutions as documented by the 'Health Vision 2050: the main document' (MoH 2014). For example, the Maternal Mortality Ratio (MMR) per

100 thousand live births has been fluctuating during the last two decades. It has dropped from 37.5 in 2002 to 13.6 in 2006, increased to 26.4 in 2010, and back to 17.8 in 2012. The importance of improving maternity care services can also be recognised by knowing that women in the reproductive age group (15-49 years) constitute more than 27% of the total population.

Additionally, the number of outpatient morbidity due to maternal causes increased from 0.299 per 1000 population in 1996 and reached 0.939 in 2012. Similarly, outpatient morbidities per 1000 population reached 1.73 in 2012 compared to 0.851 in 1996. Maternal and perinatal causes accounted for 15% of the total inpatient morbidities in 2012. In 2012, conditions related to the perinatal period were the leading causes of deaths among MoH inpatient discharges. Although the percentage of women with anaemia dropped from 36.3% in 2000 to 26.7% in 2012, this percentage is still very high. This percentage was different when examined by Governorate reaching as low as 11% in Al Wusta and as high as 33% in Musandam. This dissimilarity between governorates was also observed in the percentage of diabetes in pregnancy where it was highest in North Batinah (8%) and lowest in Wusta (less than 1%).

The above examples of health indicators show that maternity services need to receive special attention to improve the current level and reduce the dissimilarities between different governorates. In addition, the Omani MoH publishes an Annual Health Report (AHR) which contains a large amount of routine data that is mostly collected electronically. In relation to maternity services, the AHR contains around 21 indicators including the rate of caesarian section, the rate of stillbirth, mortality rate, etc... Until now, there is no systematic approach for analysing, disseminating, and acting upon these indicators.

1.2.3. The importance of quality and patient safety measurement systems

Improving the quality and safety of any service, including maternity services, will neither happen incidentally nor accidentally. An essential step in any quality improvement initiative is to establish a system that can assess the current quality of care and measure changes overtime (Draycott et al. 2010). Monitoring and measurement systems can help (1) prioritize improvement efforts, (2) assess the effectiveness of improvement initiatives, and (3) provide signals about areas that may require urgent attention (Varkey et al. 2007).

Before measuring anything, it needs to be defined. Unfortunately, there is no agreed definition of quality and safety.

Quality has been defined as 'excellence', 'meeting goals', 'zero defects', and 'fitness for use' but the most widely used definition is the Institute of Medicine which defines it as 'the extent to which health care services provided to individuals and patient populations improve desired health outcomes' (Campbell et al. 2000). According to the Institute of Medicine (2001) framework, there are six domains of health care quality which are: safe, effective, patient centred, timely, efficient and equitable. It is important, however, that quality and patient safety are not viewed as two isolated terms. Rather, patient safety can be seen as one dimension of quality of care along with the other dimensions like effectiveness, continuity and efficiency (Kohn et al. 2000).

Runciman et al. (2009) defined patient safety as '*the reduction of risk of unnecessary harm associated with healthcare to an acceptable minimum*' (page 19) while Kohn et al. (2000) defines it as '*freedom from accidental injury'* from the patients' perspectives (page 4). According to the Agency for Healthcare Research and Quality glossary, patient safety is '*freedom from accidental or preventable injuries produced by medical care'* (AHRQ 2007) while Vincent (2010) simplified it into '*The avoidance, prevention and*

amelioration of adverse outcomes or injuries stemming from the process of healthcare' (page 31). The World Health Organization defines patient safety as '*the prevention of errors and adverse effects to patients associated with health care'*(WHO 2010).

These definitions, as well other patient safety definitions, have a number of key terms such as injury, harm, error and adverse outcomes. These key terms will determine and guide organizations on what to be measured to evaluate the level of patient safety. However, even these key terms have no agreed definitions. For example, the Dutch Nationwide reporting program defines adverse outcomes as '*an unintended and unwanted event or state occurring during or following medical care, that is so harmful to a patient's health'* (Marang-van de Mheen et al. 2007) while the WHO considers adverse event as harmful incident and defines it as '*an incident that results in harm to a patient*' (WHO 2010). It can be seen that the first definition emphasises that for an event to be considered as an adverse event it should occur unintentionally. This implies that an intended harm should not be considered as an adverse event. While in most cases it is easy to differentiate between intended and unintended harm, it might be a complex issue for example in the case of harm occurring as results of medication. Furthermore, even the key terms in the patient safety definitions have alternative terms (adverse events = harmful events) which further adds confusions to the definitions.

As an attempt to unify the definition of patient safety and its related key terms, the paper by Runciman et al. (2009) provided definitions for 48 concepts and key terms. After ten years of the proposed classification, it is time to assess if these terms have been internationally unified and if there is a need to update the terms and definitions.

The inconsistent use of these terms may lead to misunderstanding and can jeopardise patient safety initiatives (Runciman 2006). If adverse outcomes, for example, is defined

differently, then it is possible that it will be measured differently and thus, the level of safety can't be assessed properly. Not only the key terms within patient safety definitions are different but also the expected and accepted level of patient safety as implied by these definitions is different. For example, the term 'reduction' to 'an acceptable minimum' implies that it is accepted and expected that 'harm' can't be reduced to zero level. On the other hand, however, the term 'freedom' implies that injuries within an organization should be zero.

Another issue with patient safety definitions is that they do not consider errors that have not caused measurable adverse event or injury (Grober and Bohnen 2005). For example, administering a medicine late or in the wrong dose might not produce a harm or injury that can be measured and based on the above patient safety definitions these errors are not measured. Thus, a more comprehensive and unified definition of patient safety is needed. A good starting point is the WHO definition that covers both adverse events and errors but this definition need to be internationally used before it is possible to compare patient safety levels across countries.

Several approaches have been proposed to measure quality and safety in healthcare. The Performance Assessment Tool for Quality Improvement in Hospitals developed by the World Health Organisation (WHO) suggested a framework of six dimensions namely clinical effectiveness, efficiency, staff orientation, responsive governance, safety, and patient centeredness. Gardner et al. (2014) used the Donabedian model (structure, process, and outcome) for measuring quality and patient safety to improve nursing services. Vincent et al. (2013) developed a more comprehensive framework for measuring and monitoring and measuring patient safety. The following sections describe the Patient Safety Measurement and Monitoring Framework (PSMMF) and some of the concepts

underpinning this framework. Then, a section will describe where and how does this thesis intersect with the framework.

1.2.4. The PSMMF

The PSMMF was based on different scoping reviews, case studies, interviews, websites reviews and board papers attempting to tackle the complexity and multidimensionality of patient safety in healthcare by learning from relevant industries. In their report, Vincent and colleagues emphasized that a patient safety measurement system should include both reactive (lagging) and proactive (leading) safety measures. The lagging-indicators measure the event after its occurrence (e.g. incident reporting and incident investigation), while leading-indicators measure the event before its occurrence (e.g. safety audits, safety culture surveys and safety walk-rounds). Additionally, they discussed six existing conceptual safety models/theories that can guide the development of patient safety measurement systems. The six models are 'safety as defences in depth', 'systems safety in healthcare', 'high reliability theory and safety', 'safety as collective mindfulness', 'system dynamics and safety', and 'safety as resilience'. The strengths and weaknesses of each model were acknowledged but Vincent and colleagues argued that the last two models view safety as a dynamic process of continuous response to variation. Based on this research, Vincent and colleagues developed a framework for safety measurement and monitoring. The framework is composed of five dimensions asking different questions in relation to patient safety (see Figure 1.2). They proposed that a measurement system that can address these dimensions will provide a comprehensive picture about the safety of an organization.

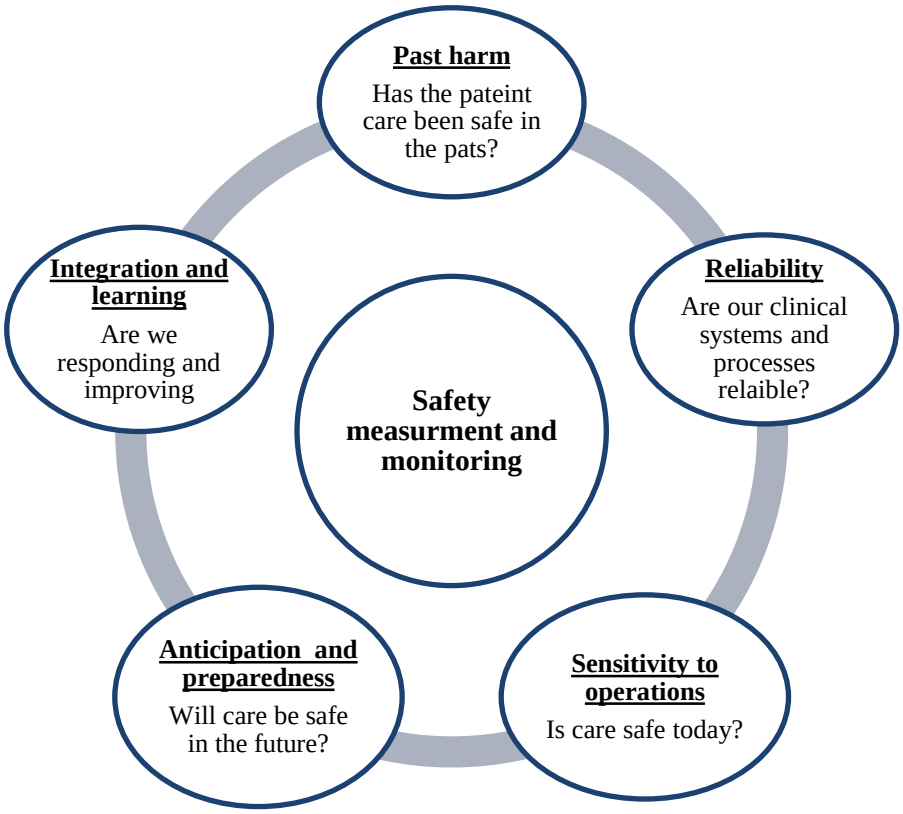

Figure 1.2: Patient safety measurement and monitoring framework, *source: (Vincent et al. 2014)*

The five dimensions of the PSMMF are past harm, reliability, sensitivity to operations, anticipation and preparedness, and integration and learning. The past harm dimension should determine the extent to which patient care has been safe in the past few months or years. The report suggested the use of valid and reliable tools that can measure the different types of harm. Examples of these tools include mortality statistics, record reviews, incident reporting and routine data.

Reliability determines whether or not the current clinical systems and processes are delivered according to the agreed standards. Deviation from an agreed standard represents low reliability while high reliability represents that these standards are being followed 100% of the time. Reliability of clinical processes and human behavior was suggested to be measured through auditing against agreed standards and guidelines. Other suggested

tools include observation of safety critical behavior, monitoring of stroke care bundle and assessment of suicide risk.

Sensitivity to operations determines if the care is safe today while the anticipation and preparedness determines whether in the future care will be safe. In the context of healthcare, sensitivity can be thought of as the active awareness by staff at different levels about the issues that can jeopardize safety before it has threatened the patient. Examples of measurement tools to help sensitivity include safety walk rounds, appointing patient safety officers, briefing and debriefing, day to day conversations and patient interviews.

The ability to expect possible safety issues will help organizations to prepare and intervene more effectively. A number of sources can be used to anticipate future issues such as risk registers, human reliability analysis, safety cases and safety culture. However, the report emphasized that organizations should use all available information sources to predict future harm. Although information like risk register and safety cases might provide information about the past, they can also provide information of what might go wrong in similar scenarios or similar contexts. For example, providing awareness, education and weekly feedback (using run charts) about anti-infective prescriptions was found by Thakkar et al. (2011) to improve compliance rates with the prescription policy. Benn et al. (2014) used monthly feedback reports to ward managers and monthly feedback reports to individual consultants about the performance of anaesthesia services. The author found that these feedback reports can help improvement at individual and system levels. When interviewed about the features of an engaging feedback system, anaesthetists perceived relevance of indicators and data credibility as important features of an effective and useful feedback. In addition, providing feedback and circulating results to staff was one of the strategies that can sustain quality and patient safety gains (Parand et al. 2012).

The fifth dimension of the PSMMF is integration and learning which answers if the organization is responding and improving as a result of the learned lessons. In this dimension it is assessed whether or not organizations are aggregating data of different sources (e.g. incidents, claims and complaints) and providing appropriate feedback. Providing feedback can foster actions and improvements at clinical and administrative level (Boyce and Browne 2013; Ivers et al. 2014; Gude et al. 2016; Reynolds et al. 2016). There are different types of feedback that organizations should consider depending on the purpose and the content of the feedback. Feedback can be provided at individual, departmental, institutional or even national level through different sources including newsletters, safety alerts, conferences, meetings and the hospital intranet system.

There are a number of issues that need to be addressed to maximize the use of the framework. One of the main issues is that organizations need to customize the tools and techniques that can address each of the framework dimensions. Since there is no clear line demarcating each dimension of the framework and many dimensions are overlapping, it would be challenging to agree on which tool covers which dimension. Another issue is the relation of each dimension to one another and the effect of a weakness in one dimension on the remaining dimensions (Vincent et al. 2014). That is to say, it is challenging to decide on the weight to be given for each dimension.

Even though the framework had positive perception after being tested in three NHS trusts in the UK as reported by Illingworth (2014), further work is needed before concluding its potential. Questions like what is the potential impact of the framework on patient safety and what resources are needed to be put in place to ensure full package implementations need to be examined by future research. Another important issue that need to be addressed before adopting the framework is its applicability in different parts of the world. For

example, developing countries like Oman have different infrastructure, different priorities and different values and culture. Also, integrating this framework with existing monitoring tools might not be straight forward. As this framework was mainly developed for and by the developed countries, it needs to be introduced cautiously before full adoption. Additionally, its introduction in these countries needs to be closely monitored to evaluate its impact on patient safety. Despite the challenging issues that might face the application of the PSMMF, its comprehensiveness makes it a good starting point to guide the development of a national system for monitoring quality and patient safety. It is important, however, that the effectiveness of the monitoring framework is periodically examined and modified according to the needs and priorities.

1.2.5. The PSMMF and this research

Although the PSMMF was originally made for measuring and monitoring patient safety, in this research its use is extended to include quality of care, since patient safety can be considered as an element or a dimension of quality. This research focuses on three aspects of maternity care that will form part of the basis for a national quality and safety of care measurement system to support quality improvement initiatives in maternity units. The three approaches are: patient safety culture, maternal satisfaction and caesarean section rates. These specific approaches, in the presence of others, were selected because of the accumulating evidence about their feasible application and usefulness for measuring and improving the quality and safety of care. While the researcher recognizes the presence of other monitoring tools like incident reports, auditing, safety rounds, and many others, using only three approaches was based on considering the allocated time for the project and the available resources. The evidence supporting the application and usefulness of the selected approaches in maternity units will be explored in the literature review chapters.

Based on PSMMF, the monitoring approaches used in this research fall generally under two dimensions of the framework. Using statistical process control charts to examine caesarean section rates during the previous years can address the question: has the patient care been safe in the past (past harm)? Patient safety culture surveys and maternal satisfaction address the question: will care be safe in the future (anticipation and preparedness). It is important to note that using these approaches is just the building block towards the possible implementation of the framework in maternity units and possibly across other units and departments. A number of measurement tools are being used across all units in governorate hospitals such as incident reporting system, auditing and mortality statistics. Examining the existing approaches and their contribution to patient safety is beyond the scope of this research.

1.3. Overall aim and objectives of the thesis

This thesis aims to develop a quality and safety measurement system for the maternity units in Oman using three approaches. The three approaches are: patient safety culture, patient satisfaction, and caesarean section rates. The specific objectives of the research are:

- To measure patient safety culture level
- To examine the association between nurse's nationality and patient safety culture
- To validate an Arabic language survey to measure maternal satisfaction about the childbearing experience.
- To measure patient satisfaction about the childbearing experience
- To examine caesarean section rates across maternity units using statistical process control charts

Chapter 2

Patient Safety Culture in Maternity Units: A Narrative Literature Review

The material presented in this chapter is accepted and published as:

Al Nadabi, W., McIntosh, B., McClelland, T. and Mohammed, M. (2019) Patient safety culture in maternity units: a review. International Journal of Health Care Quality Assurance 32 (4) 662-676

2. Chapter two: Patient Safety Culture in Maternity Units: A narrative literature review

2.1. Abstract

There is an increasing effort to enhance the safety and quality in maternity units. Although improving safety culture is considered an integral step in these efforts, the use of patient safety culture in maternity units has not been previously reviewed. This chapter reviewed the literature to (1) summarize studies that have examined patient safety culture (PSC) in maternity units and (2) describe the different purposes, study designs and tools reported in these studies, whilst (3) highlighting gaps in the literature. Peer-reviewed studies published in English during 1961-2016 across eight electronic databases were subjected to a narrative literature review. Among 100 articles considered, 28 met the inclusion criteria. The main purposes for studying PSC were: (a) assessing intervention effects on PSC (n= 17); and (b) assessing PSC level (n=7). Patient safety culture was mostly assessed quantitatively using validated questionnaires (n=23). The Safety Attitude Questionnaire was the most commonly used questionnaire (n=17). The time between the baseline and the follow-up assessment varied from six months up to 24 months. No study reported measurement costs, and none incorporated the patient's voice in assessing PSC. In conclusion, the measurement and enhancement of patient safety culture in maternity care units is increasingly essential and feasible using validated questionnaires although obtaining adequate response rates to questionnaires and devising interventions appears to be challenging. Future studies should find ways of incorporating the patient's voice.

2.2. Introduction

Despite all the efforts made over the last few decades, improving the safety of maternity services continues to be an urgent item on the international agenda. According to the Sustainable Development Goal Number 3.1, the United Nations aims to reduce the global maternal mortality ratio to less than 70 per 100,000 live births by the year 2030 (UN 2015). However, despite the recognised decline since 1990, the maternal mortality ratio in 2015 was above 200 for every 100,000 live births which is equivalent to 303,000 mothers dying due to pregnancy or childbirth-related complications (WHO 2015). Thus, this mismatch between the target and the current level of maternal mortality ratio urge nations to invest in new strategies to improve the quality and safety of maternity services.

Many strategies have been reviewed which have been found to improve the quality and patient safety for example; the use of checklists, reminders, hand hygiene, training, medication reconciliation and many others (Shekelle et al. 2013). However, these strategies may not produce the expected improvements without the presence of a conducive environment that encourages, reminds, and motivates staff towards improving patient safety. This environment has been called patient safety culture (PSC) or Patient Safety Climate (PSC). Increasingly, researchers are highlighting the importance of PSC in ensuring and enhancing the quality of care and patient safety, and a strong culture of safety is seen as a pre-requisite for ensuring the success of initiatives to improve patient safety (Weaver et al. 2013b).

2.2.1. What is already known about PSC?

The theories underlying patient safety climate and culture were systematically reviewed by Guldenmund (2000) who concluded that safety culture reflects the basic ‘assumptions’ about safety while safety climate refers to the prevailing safety-related ‘attitudes’ within

an organisation. Halligan and Zecevic (2011) reviewed the different concepts, definitions, domains and measures of patient safety culture (PSC). They found that researchers disagreed on the definition, domains, and measures of PSC but noted that the most common term used was safety culture as opposed to safety climate. However, some authors use both terms interchangeably. Safety culture is mostly defined as '*the product of individual and group values, attitudes, competencies and patterns of behaviour that determine the commitment to, and the style and proficiency of an organisation's health and safety programmes'* while safety climate is mostly defined as '*surface features of the safety culture from attitudes and perceptions of individuals at a given point in time' or 'the measurable components of safety culture'* (Halligan and Zecevic 2011).

Colla et al. (2005) reviewed the various tools which have been used to measure PSC. They identified nine different tools for measuring PSC, all using Likert scales. Another review by Singla et al. (2006) found a total of 13 instruments covering a total of 23 domains. Examples of domains covered by PSC studies include management and institutional commitment to safety, adequacy of training and supervision, non-punitive response to error, work pressure, patient safety planning teamwork, communication openness, and others. However, there is no consensus regarding which tool (or questionnaire) is most effective for measuring PSC and the choice is often determined by the context of the study.

While it is posited that an enhanced PSC should lead to better outcomes, studies have not always found this. Le Coze (2019) identified four different views about the usefulness of patient safety culture. These views range from rejecting the view of safety culture to accepting and supporting its usefulness. The author explained that the reason behind the critical (rejecting) view was because there was no academic basis for patient safety culture

but rather a 'fashion' that was shaped and influenced by business markets and consultants. Le Coze called for a cautious view where subcultures should be studied, and researchers should work closely with practitioners so that practical solutions are identified for their routine issues. In a meta-analysis by Groves (2014), there was a non-significant relationship between PSC and patient outcomes – perhaps because of the small number of studies included in their review. In contrast, DiCuccio (2015) studied the relationship between PSC and patient outcomes and found that improved PSC was significantly associated with reduced mortality, increased family and patient satisfaction, reduced readmission rates, decreased community-acquired pneumonia rate, and decreased hospital-acquired pressure ulcers.

2.2.2. PSC in Maternity Units

Although measuring PSC across a hospital provides a snapshot of the overall prevailing safety culture, Sinni et al. (2011) argue that the departmental level is the most appropriate level for studying PSC. At this level, improvement strategies can be tailored to specific departments instead of developing a strategy that may work in one department but not in others. Several PSC studies were conducted in maternity units. However, to the best knowledge of the researcher, and despite the extensive work in the area of PSC, the work related to PSC in maternity units has not been (systematically) reviewed. The study by Sinni et al. (2011) reviewed the initiatives related to patient safety in maternity but did not specifically focus on the PSC in maternity units.

This narrative review summarises the studies that have examined PSC in maternity units. Conducting such a review is very important, not only because the safety of maternity units lies high on the international agenda but also because studying PSC at the unit level helps in tailoring future improvement strategies (Smits et al. 2009). This narrative review aimed

at describing the studies that have examined PSC in maternity units. Its specific objectives were (a) to report the different designs and tools that have been used to examine PSC in maternity units, (b) to examine the different purposes for examining PSC in maternity units, and (c) to identify any gaps in the literature.

2.3. Methods

A narrative literature review was followed which is according to Booth et al. (2012), a type of review where the literature is reviewed comprehensively and systematically. This methodology allows the reviewer to descriptively summarise different study designs using summary tables. Additionally, it helps to identify any gaps in the literature. However, narrative reviews are criticised for being less useful in identifying commonalities (Lucas et al. 2007). Unlike systematic review where a specific question is examined with an aim to provide a clear answer, narrative reviews are usually used to provide a general overview about the existing knowledge about the topic and to guide the formation of follow up research questions (Pae 2015).

2.3.1. Review protocol

The review protocol is shown in Table 2.1. While there are a number of models that can be used to guide the search method such as sample, phenomenon of interest, design, evaluation, research type (SPIDER) and setting, perspective, intervention, comparison, evaluation (SPICE), population, intervention, comparator, and outcome (PICO) model is the most commonly used according to the review by Eriksen and Frandsen (2018). The Cochrane Handbook for Systematic Reviews of Interventions identified PICO as an essential model for conducting review questions to guarantee that all the parts of questions are clearly described (Eriksen and Frandsen 2018). In this review, PICOS (population,

intervention, comparator, outcome, and study type) model was used to guide the review process and key term selection (Miller and Forrest 2001).

Table 2.1: Review protocol

	Inclusion criteria	**Exclusion criteria**
Population	Maternity units, Obstetrics units, Pre and post-natal departments, Midwifery, Community and hospitals	Other health services
Intervention	Assessment of PSC	Organizational culture, Patient safety outcomes
Comparator	None	
Outcomes	PSC assessment tools, response rates, purposes of the assessment.	PSC concepts and definition
Study	Qualitative, quantitative and mixed. Published in English before 2016	Grey literature

2.3.2. Search strategy

Search terms were first used in Medline and applied to other databases. A specialist librarian informed the selection of search terms. Additionally, term selection was guided by the list of terms used in other PSC-related systematic reviews (Halligan and Zecevic 2011; Groves 2014). Terms appearing as keywords and subject headings were combined to search for articles that assessed PSC in maternity units. Examples of terms used to search for maternity-related articles include Matern*, Obstetric*, gyn*cology and reproductive health service*. These terms were combined with terms that covered patient safety culture. Examples of the terms used include safety culture, safety climate and safety attitudes. See Table 2.2 for an example of the search strategy used in Medline and replicated for all other databases.

Table 2.2: Search terms used for PSC review

	Query	**Results**
S21	S11 AND S16 AND S19 (limit to Journal article, English language)	2,767
S20	S11 AND S16 AND S19	2,899
S19	S17 OR S18	446,143
S18	"patient safety"	29,080
S17	"safety"	446,143
S16	S12 OR S13 OR S14 OR S15	2,194,841
S15	"behavior*"	1,182,717
S14	"attitude*"	349,418
S13	"climate"	76,622

S12	"culture"	714,657
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	1,221,897
S10	"pregnancy"	846,587
S9	"antenatal"	27,958
S8	"postnatal"	91,562
S7	"perinatal"	69,024
S6	"midwif*"	37,362
S5	"reproductive care"	268
S4	"reproductive health service*"	2,359
S3	"gyn*cology"	251,779
S2	"obstetric*"	353,191
S1	"matern*"	299,442

2.3.3. Sources of data

The search engines used for this literature review were: Cumulative Index to Nursing and Allied Health Literature (CINAHL); Embase (not Medline); the Health Management Information Consortium (HMIC); Medline; Psych INFO; Allied and Complementary Medicine Database (AMED); Applied Social Sciences Index and Abstracts (ASSIA); and Maternity and Infant Care Database (MIDIRS).

2.3.4. Inclusion criteria

To be included in the review, studies needed to be peer-reviewed and conducted to measure patient safety culture/climate in maternity units including midwifery, obstetric services, and labour services. Only studies that were published in English and freely accessible were reviewed. No limits were made for the year of publication, study design or the setting within which the study was undertaken.

2.3.5. Exclusion criteria

Studies that only discussed the concepts and definitions of PSC were excluded. Studies that examined patient safety without referring to PSC were also excluded. Additionally, studies that examined the whole hospital without specifically mentioning maternity units were excluded. The domains of PSC (e.g. teamwork and continuous improvement) are closely connected to the domains of the overall organisational culture, and thus, papers

that examined these domains without a direct link to safety culture were excluded. Furthermore, articles assessing the impact of patient safety programmes on patient safety outcomes without referring to PSC were excluded from this review.

2.3.6. Data extraction and data synthesis

Data extraction and data synthesis were performed using narrative synthesis which involve the use of text-based data for answering the review questions (Snilstveit et al. 2012). Tables were used simultaneously to summarise and group essential information and results about the included studies (Popay et al. 2006). The headings of the tables were formulated around the research questions. For example, table 2.3 summarized the tools used to measure PSC, the different PSC study designs and the purposes of conducting PSC studies.

2.3.7. Critical Appraisal

Three tools were used to critically appraise the different study designs. The quality of the quantitative studies included in this review was assessed using the Center for Evidence Based Management (2014) Critical Appraisal of a Cross-Sectional Study tool (see Appendix 1). The qualitative studies were assessed using the Critical Appraisal Skills Programme (2014) while the mixed methods studies were assessed using the HCPRDU Evaluation tool for mixed methods studies developed by Long et al. (2002) (See Appendix 2 and Appendix 3). To summarise the quality of reporting a simple one point scoring system per criterion was adopted. The extent of publication bias could not be assessed in this review.

2.4. Findings

Conducted in June 2016, a total of 5,630 articles were retrieved across eight databases. Figure 2.1 summarises the search strategy and selection process using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements (Liberati et al. 2009; Moher et al. 2009). After removing duplicate records, the remaining 4,535 articles were scanned for eligibility through the title and abstract. A total of 100 articles underwent a full-text review, and 28 studies were found to meet the inclusion criteria. The remaining studies were excluded, either because they were not specific to PSC but were related to other topics such as job satisfaction, teamwork, and burnout. Other articles were also excluded because they were discussing the concepts, definitions, or theories related to PSC. As stated in Chapter 3, an updated search was conducted in 17th August 2018 but no new articles meeting the inclusion criteria were found.

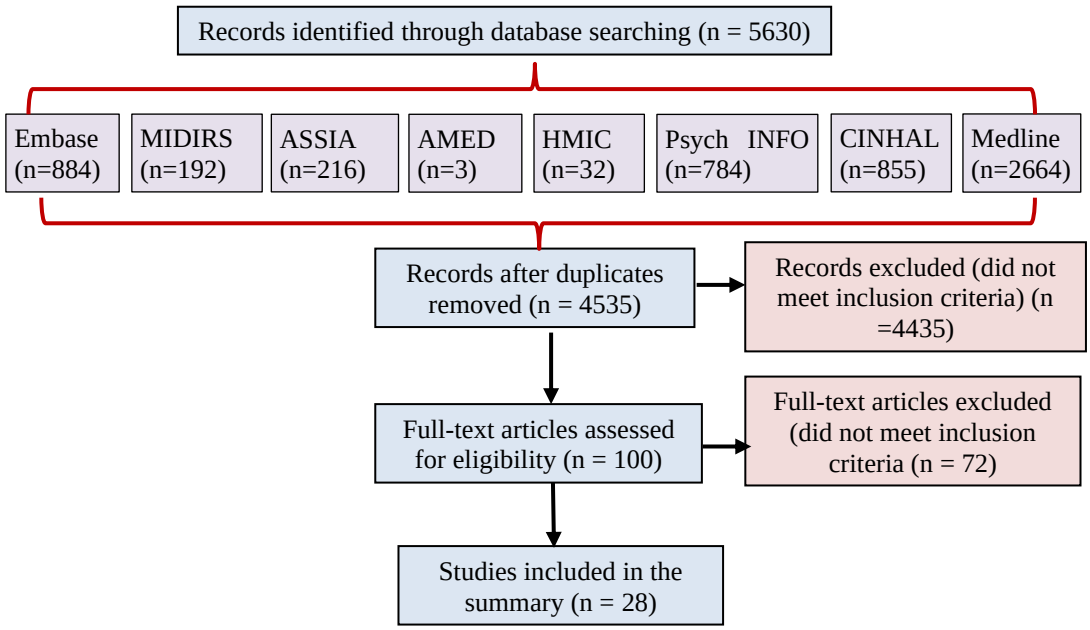

Figure 2.1: PRISMA Flow chart of search strategy and selection process for PSC study

2.4.1. Study design and Tools used to measure PSC in maternity units (Table 2.3)

PSC was mostly assessed quantitatively (n=23) using a self-administered questionnaire that was distributed and completed by different staff categories (e.g. doctors, nurses, midwife, etc.). Different questionnaires were used to assess PSC in maternity units, but

the Safety Attitudes Questionnaire (SAQ) was the most commonly used tool (n=17). Other tools included the Safety Climate Scale (n=3), Hospital Survey on Patient Safety Culture (HSOPSC, n=2), Cultural Assessment Survey (n=2), Systematic Culture inquiry On Patient Safety for Primary Care (n=2), and a 10-item survey (n=1). Authors who selected the SAQ justified and attributed their selection to the psychometric validity of this tool. Although Siassakos et al. (2011) stated that SAQ is the only tool that has been validated for assessing processes and outcomes in healthcare, several other tools (SCS, HSOPSC, CAS, SCOPE-PC) have also been reported to have been validated.

Two studies used a qualitative approach. Abbott et al. (2012) observed staff attitudes in two delivery units while Currie (2009) used focus group discussions with different group members in an obstetric unit to assess PSC qualitatively. Three studies used a mixed methods approach two of which aimed at comparing the use of both surveys and interviews to examine PSC (Allen et al. 2010; Freeth et al. 2012). The third mixed method aimed at developing a measurement tool to examine PSC (Milne et al. 2010). None of the studies reported the involvement of patients in assessing PSC.

2.4.2. Purpose of studying PSC in maternity units (Table 2.3)

PSC was examined for different purposes. The two main purposes were: (a) to measure the effectiveness of an intervention in improving PSC, patient safety or quality outcomes (n=17), (b) to examine and compare the current status of PSC (n=7). A third objective of conducting PSC was to determine the benefits of combining surveys with other tools to assess PSC. For example, Allen et al. (2010) studied the added benefits of using surveys, interviews and policy audits to examine PSC in maternity units. They concluded that interviews were useful in augmenting the survey results. Freeth et al. (2012) compared two different methodologies used to examine PSC, surveys and observations. They found

that results from both methods showed a considerable level of agreement, but when compared with observation-based data, the survey findings were closer to the audit-based results. Additionally, Milne et al. (2010) and Verbakel et al. (2013) conducted a PSC study to test and validate a new tool for measuring PSC in maternity units. The new tools were reported to be reliable and could be used to examine the change of PSC in obstetric units.

Table 2.3: Tools, design, purpose, and interventions used to measure PSC

Author	Tool used to assess safety culture				Study design			Purpose of the study			Interventions	
	SAQ	SCS	HSOPSC	(CAS, SCOPE-PC)	Qualitative	Quantitative	Mixed	Assessing PSC	Assess effect of interventions	Assess/develop a measurement tools	Yes	No
(Abbott et al. 2012)					√							√
(Ackenbom et al. 2014)				√		√			√		√	
(Allen et al. 2010)	√	√					√			√		√
(Burke et al. 2013)			√			√			√		√	
(Channing et al. 2015)	√					√			√		√	
(Currie 2009)					√			√				√
(Freeth et al. 2012)		√					√			√		√
(Fujita et al. 2014)			√			√		√				√
(Haller et al. 2008)	√					√			√		√	
(Lavery et al. 2014)				√		√			√		√	
(Martijn et al. 2013)	√					√		√				√
(Marzolf et al. 2015)	√					√			√		√	
(Miller et al. 2008)	√					√			√		√	
(Milne et al. 2010)				√			√			√		√
(Pettker et al. 2009)	√					√		√	√		√	
(Pettker et al. 2011)	√					√			√		√	
(Pratt et al. 2007)	√					√			√		√	
(Raab et al. 2013)	√					√			√		√	
(Raftopoulos et al. 2011)	√					√		√				√
(Riley and Davis 2011)	√					√			√		√	
(Shoushtarian et al. 2014)	√					√			√		√	
(Siassakos et al. 2010)	√					√			√		√	
(Siassakos et al. 2011)	√					√		√				√
(Simpson et al. 2011)	√					√			√		√	
(Sørensen et al. 2013)	√					√			√		√	
(Verbakel et al. 2014)				√		√		√				√
(Verbakel et al. 2013)				√		√				√		√
(Wagner et al. 2012)		√				√			√		√	
Total	**17**	**3**	**2**	**5**	**2**	**23**	**3**	**7**	**17**	**4**	**17**	**11**

*__SAQ__: Safety Attitude Questionnaire, __SCS__: Safety Climate Scale, __HSOPSC__: Hospital Survey on Patient Safety Culture, __CAS__: Cultural Assessment Survey, __SCOPE-PC__: Systematic Culture inquiry On Patient Safety for Primary Care, __PSC__: Patient Safety Culture

2.4.3. Settings, participants and response rate (Table 2.4)

None of the studies included in this review were conducted in a private setting. All studies were conducted in public, community, or academic settings. All studies were either at the national level, hospital level or unit level. The hospital level studies included maternity units along with the other departments. For example, the study by Raftopoulos et al. (2011) was carried out at the national level where all maternity units were included. The study by Siassakos et al. (2011) is an example where only one maternity unit was studied. Not surprisingly, no study was conducted at the individual staff level as PSC reflects the culture within a group of staff.

Studies in this review were published during the period from 2007-2015. In terms of the geographical distribution of the studies, 11 out of the 28 studies were conducted in the United States while six studies were conducted in the UK and three in the Netherlands. The remaining studies were conducted in Japan, Switzerland, Cyprus, Canada, Eritrea, Australia and Denmark.

The response rate was reported by 18 out of the 23 quantitative studies and varied significantly from as low as 24% (Verbakel et al. 2014) to as high as 100% (Siassakos et al. 2010). The 100% response rate was reached when participants were handed the questionnaire just before they joined the training sessions. Allen et al. (2010) found that the response rate was highest (100%) when participants were handed the questionnaire individually, and lowest (21%) when surveys were mailed to individuals.

According to the guidelines for administering the SAQ, response rates should typically be between 60% to 70% (Sexton 2003). Out of the 17 studies that used SAQ, 12 studies reported the response rate and 10 of them (83%) met the recommended rate (above 60%). Similarly, the recommended response rate for the HSOPSC is 50% (Westat 2016). Out of

the two studies that used HSOPSC, one study reported the response rate (Fujita et al. 2014) and this met the recommended rate.

Almost all studies that examined PSC attempted to include multi-professional staff working in maternity units. However, the study by Raftopoulos et al. (2011) was confined to midwives. Two studies described clearly the exclusion criteria for participants. For example, Siassakos et al. (2011) followed the eligibility criteria for inclusion as outlined by Sexton (2003) which states that staff need to be working in the same unit for a minimum of 4 weeks for 20 hours per week. Similarly, Freeth et al. (2012) excluded students and staff who joined the unit less than 4 weeks before the date of administering the survey.

Table 2.4: Settings, participants and response rate

Author	Country				Response rate	Met the criteria for SAQ*** survey (>60%)	
	US*	UK**	Netherlands	Others		Yes	No
(Abbott et al. 2012)		√			NA	NA	NA
(Ackenbom et al. 2014)	√				62% (before) and 52% (after)	NA	NA
(Allen et al. 2010)				√	28%		√ (SAQ)
(Burke et al. 2013)	√				Not reported	NA	NA
(Channing et al. 2015)		√			82% (baseline), 67% (post-intervention)	√ (SAQ)	
(Currie 2009)		√			NA	NA	NA
(Freeth et al. 2012)		√			27.6% (range: 9-47%)		
(Fujita et al. 2014)				√	75.60%		
(Haller et al. 2008)				√	94.90%	√ (SAQ)	
(Lavery et al. 2014)	√				Not reported		
(Martijn et al. 2013)			√		88%	√ (SAQ)	
(Marzolf et al. 2015)				√	77.6% (before training), 95.6% (after)	√(SAQ)	
(Miller et al. 2008)	√				Not reported		
(Milne et al. 2010)				√	47.7% (first phase), 62.9% (third phase)		
(Pettker et al. 2009)	√				89%, 95% and 94%	√(SAQ)	
(Pettker et al. 2011)	√				89%, 95%, 94%, 72%	√(SAQ)	
(Pratt et al. 2007)	√				Not reported		
(Raab et al. 2013)	√				72%	√(SAQ)	
(Raftopoulos et al. 2011)				√	75.71%	√(SAQ)	
(Riley and Davis 2011)	√				Not reported		
(Shoushtarian et al. 2014)				√	47.6% (before training), 45.9% (after)		√ (SAQ)
(Siassakos et al. 2010)		√			100%	√(SAQ)	
(Siassakos et al. 2011)		√			69%	√(SAQ)	
(Simpson et al. 2011)	√				Not reported		
(Sørensen et al. 2013)				√	Not reported		
(Verbakel et al. 2014)			√		24%		
(Verbakel et al. 2013)			√		38.40%		
(Wagner et al. 2012)	√				Not reported		
Total	**11**	**6**	**3**	**8**	**18/23 (out of quantitative studies)**	**10/12 for SAQ**	**2/12 for SAQ**

US: United States, **UK:** United Kingdom, **SAQ:** Safety Attitude Questionnaire

2.4.4. Lessons reported by included studies

Authors articulated several limitations that needed to be considered when planning future studies in PSC. First, Fujita et al. (2014) found that cross-sectional studies were not useful for explaining the reason for variations in PSC level across different clinical units. Therefore, qualitative studies are critical when the aim is to explain variations in PSC level between several departments within a hospital or across hospitals. Despite the additional useful information that can be collected through qualitative studies, quantitative assessment of PSC remains the best option if the results are to be generalised and compared across departments or hospitals. Additionally, quantitative studies are more useful when improvements are to be followed-up over a period of time.

Second, the generalisability of quantitative studies might also be challenged if no actions were taken to improve response rates and to minimise the possibility of selection bias. Four studies reported low response rates which might indicate that the results were not representative. For example, Freeth et al. (2012) reported that the response rate was only 27.6% which limited the usefulness of their results. Low response rates were attributed to the challenge of finding the addresses of health professionals (Verbakel et al. 2014), the lack of an allocated time slot to complete the questionnaire (Verbakel et al. 2013) and when surveys were posted by mail to individuals (Allen et al. 2010). On the other hand, however, response rates had reached to 100% when surveys were handled directly to individuals. This case confirms that the response rate can be improved by changing the survey distribution method and thus, investigators need to consider this before executing any PSC study. Guidelines are available on how to maximise the response rate when using some of the common tools such as SAQ and HSOPSC (Sexton 2003; Westat 2016).

Additionally, evidence-based practices to improve response rates and selection bias need to be considered when planning any quantitative studies (McColl et al. 2002).

Third, attributing the change in PSC level to a specific strategy can be challenged especially if the intervention coincided with other unplanned activities such as a change in policy. For example, Riley and Davis (2011) mentioned that their results could be contaminated by other possible factors such as change in policy and personnel. Haller et al. (2008) mentioned other factors that may have influenced PSC results like differences in staff profile, seasonal differences, resources available between the two assessments, pre-and-post-intervention. Thus, investigators need to be aware and report any changes that may affect the PSC.

2.5. Discussion

The review of PSC studies in maternity units provides some valuable insights. (1) PSC is considered to be an increasingly important aspect of safety in maternity units, and although most studies are in higher-income countries, it is likely to be important in lower income settings as well. (2) PSC can be measured using validated questionnaires that are completed by multi-professional staff, although obtaining adequate response rates may be challenging. (3) While there is no consensus on which questionnaire to use, the SAQ is a popular choice perhaps because it is relatively short, although unlike the HSOPSC it lacks an overall summary score (Anderson 2013). (4) Although interventions have been used to enhance PSC, the types of interventions and their effectiveness in improving PSC need to be examined.

Most of the studies measured PSC in a cross-sectional design. Fujita et al. (2014) noted that cross-sectional studies do not explain the reason for variations in the level of PSC across different clinical units. Therefore, qualitative studies are required to study the

reason for variations in PSC level. Nonetheless, quantitative measures of PSC offer a way to periodically monitor PSC especially when improvements are to be followed-up over time. It might be argued that comparing PSC across units and wards might not be useful because results might not reflect true differences/similarities. However, rigorously conducted studies may produce useful information where highest scoring wards/units can share their best practices with the lowest scoring units (Deilkås and Hofoss 2010; Wagner et al. 2013). Thus, comparing results should be with the aim to learn from each other and not to blame or shame any individual or institution. To allow the sharing and learning from each other's best practices, it is important that the study results are used for improvement purposes rather than for rating or legal purposes. To foster improvement over time it might useful to compare performance against oneself over time.

The studies included in this review demonstrate that examining perceptions about PSC in maternity units is feasible. These studies have shown that it is possible to examine the perceptions about PSC in a single maternity unit, in comparison with other departments within a hospital, or in comparison with other maternity units in other hospitals. However, assessing PSC in maternity units along with other departments in a hospital is of limited use because hospital-wide assessment does not take into account differences between departments (Fujita et al. (2014).

Although most researchers agreed on the importance of a baseline PSC level before starting any intervention, the period for follow-up measurement of PSC varied. The variation issue is further complicated by the fact that most hospitals (including units) frequently change protocols, policies, staffing and many other factors that act as confounding factors affecting the results of PSC especially if re-assessment was conducted after a long period from the baseline (Haller et al. 2008). The guidelines for

using the SAQ (Sexton 2003) and the HSOPSC (Westat 2016) did not specify any period for the follow-up assessment. Consequently, the duration between the baseline assessment and the follow-up assessment needs to be studied and planned.

None of the studies in this review reported the involvement of patients in assessing the PSC. Given the importance of patient centred care in maternity and the insight that patients can provide in respect of quality and safety, future studies need to find ways of incorporating the views and perspectives of patients (and families/friends) in the assessment and enhancement of PSC (BAKER et al. 2005). According to Le Coze (2019), for patient safety culture studies to be successful, it is important that researchers should connect closely with practitioners and provide answers to issues they face on their daily work. Additionally, the author emphasized that patient safety has been used, unfortunately, as a business for consultants and companies and thus, recruiting consultants to provide answers to enhance patient safety might be a bad choice.

2.6. Limitations of this review

The screening of the papers was conducted by a single reviewer which may introduce an element of selection bias. Grey literature was not included in this review. Additionally, it is possible that researchers may not have attempted to publish their studies or their papers were not accepted for publication when the results were inconclusive or were negative. This introduces a potential threat for publication bias especially for studies where interventions to enhance PSC proved less successful. Nonetheless, the general conclusions relating to the measurement of PSC are unlikely to be undermined by these limitations.

2.7. Recommendations for future studies

Studies reporting the measurement and monitoring of PSC in maternity units need to clearly state how they arrived at the specified sampling plan, to report the response rates and to provide costs of undertaking, analysing and feeding back the results. Future studies need to determine how often PSC surveys should be undertaken for monitoring purposes and how best to incorporate the voice of the patient. Further, interventions available to improve PSC in maternity units and their effect on PSC level need to be reviewed.

2.8. Conclusions

The measurement and enhancement of patient safety culture in maternity care units is increasingly essential and is feasible when using validated questionnaires although obtaining adequate response rates to questionnaires and devising interventions appear to be challenging. Future studies should find ways of incorporating the patient's voice.

Chapter 3

Interventions to improve PSC in maternity: a narrative review

3. Chapter three: Interventions to improve PSC in maternity: a narrative review

3.1. Abstract

Despite its significant effect on quality and safety of care, interventions to improve safety culture in maternity have not been reviewed. This chapter summarizes these interventions and their impact on safety culture in maternity units. Peer-reviewed studies published in English on or before 2018 that examined patient safety culture in maternity units were reviewed across eight databases. Eleven papers met the inclusion criteria comprising ten cross-sectional design and one randomised control trial. Interventions were either a single (6/11) or multiple (5/11) for a duration ranging from three months to four years. While the single intervention involved a multidisciplinary training program, the multiple interventions included expert review, protocol development/update, and interdisciplinary clinical training program. Two studies reported the cost of the intervention. The three months 'Maintaining Safety Culture' comprehensive program costed 18,000 $ while the four-year program had 210,000$ initial cost and 150,000 annual costs. Ten studies reported a significant improvement in safety culture after the intervention but the randomized trial study contributed the non-significant improvement to the high baseline safety score. No study compared between the effects of a single intervention vs. multiple intervention on safety culture. In conclusion, there are a number of interventions that can be used to improve safety culture in maternity units. Although enhancing safety culture is possible using either a single or multiple interventions, the reported intervention costs questions the affordability of these interventions. Thus, more rigours evaluation studies are needed to determine the relative-effectiveness of each intervention and to guide the selection of the most effective intervention.

3.2. Introduction

It was highlighted in the previous chapter that PSC is argued to be a requirement for the success of safety enhancement initiatives and is increasingly being measured in maternity units. Although there is a critical view with regard to safety culture by some authors (Le Coze 2019), there is growing evidence to suggest that improving safety culture within healthcare organisations is feasible. For example, Morello et al. (2013) systematically reviewed the different strategies used to improve PSC. They concluded that among the 11 different strategies with documented impact on PSC, leadership walk-rounds and multifaceted unit-based programmes have some evidence to support their positive impact on PSC. Similarly, Weaver et al. (2013b) reviewed strategies to improve safety culture and concluded that improving PSC is possible despite the limitations of the included studies. However, both reviews examined interventions to improve PSC at the hospital level and did not focused on the maternity level. The study by Sinni et al. (2011) reviewed the initiatives related to patient safety in maternity but did not specifically focus on the PSC.

This review aims to summarise studies that used interventions to improve PSC in maternity units. More specifically, this review aims to answer: (1) what are the different strategies that are being used to improve PSC in maternity? (2) How effective are these interventions? And (3) what indicators/approaches are being used to assess the effectiveness of these interventions. Conducting such a review will help different stakeholders including clinicians and decision makers to select the most appropriate strategy for maternity units and to allow them to measure the progress of PSC over time (Smits et al. 2009).

3.3. Methods

A narrative literature review was followed which is according to Booth et al. (2012), a type of review where the literature is reviewed comprehensively and systematically. This methodology allows the reviewer to descriptively summarise different study designs using summary tables. Additionally, it helps to identify any gaps in the literature. However, narrative reviews are criticised for being less useful in identifying commonalities (Lucas et al. 2007). Unlike systematic review where a specific question is examined with an aim to provide a clear answer, narrative reviews are usually used to provide a general overview about the existing knowledge about the topic and to guide the formation of follow up research questions (Pae 2015). While a realist literature review might be more appropriate for evaluating the effectiveness of interventions and guiding decision making (Pawson et al. 2005), this review did not aim to evaluate individual interventions but rather to summarize the available and existing interventions. Therefore, a narrative literature review was considered the most appropriate approach for answering the research questions.

3.3.1. Review protocol

The review protocol is shown in Table 3.1. While there are a number of models that can be used to guide the search method such as sample, phenomenon of interest, design, evaluation, research type (SPIDER) and setting, perspective, intervention, comparison, evaluation (SPICE), population, intervention, comparator, and outcome (PICO) model is the most commonly used according to the review by Eriksen and Frandsen (2018). The Cochrane Handbook for Systematic Reviews of Interventions identified PICO as an essential model for conducting review questions to guarantee that all the parts of questions are clearly described (Eriksen and Frandsen 2018). In this review, PICOS (population,

intervention, comparator, outcome, and study type) model was used to guide the review process and key term selection (Miller and Forrest 2001).

Table 3.1: Review protocol

Population	Staff in maternity units, obstetrics units, pre and post-natal departments, midwifery, community and hospitals
Intervention	Any intervention
Comparator	None
Outcomes	Patient safety culture score
Study	Quantitative studies Published in English before 2018

3.3.2. Search strategy

The search in this review involved two stages. Initially, all records from the previous review were retrieved. Then, an updated search was conducted on 17th August 2018. The updated search used the same terms used in the initial stage where maternity-related terms were combined with PSC-related terms. Similarly, search terms were first used in Medline and applied to other databases (see Appendix 4).

3.3.3. Sources of data

The search engines used for the updated search were: Cumulative Index to Nursing and Allied Health; Embase; Medline; PsychINFO; Allied and Complementary Medicine Database; and Applied Social Sciences Index and Abstracts. Unlike the initial search, the Health Management Information Consortium and the Maternity and Infant Care Database were not used for the updated search because by that time subscription to these two databases were discontinued by the University.

3.3.4. Inclusion criteria

In addition to the inclusion criteria used in the initial search where studies were included if they were peer-reviewed, freely accessible, and written in English, studies also needed to be measuring PSC before and after an intervention(s). No limits were applied for the year of publication, study design or the setting within which the study was undertaken.

3.3.5. Exclusion criteria

Studies were excluded if they only discussed the concepts and definitions of PS culture/climate, examined patient safety without referring to patient PSC, or examined the whole hospital without specifically mentioning maternity units.

3.3.6. Data extraction and data synthesis

Data extraction and data synthesis were performed simultaneously using tables to summarise key information and results.

3.3.7. Critical Appraisal

The quantitative studies included in this review were assessed using the Critical Appraisal of a Cross-Sectional Study tool (Center for Evidence Based Management 2014). The results of the assessment can be seen in Appendix 5. To summarise the quality of reporting, a simple one-point scoring system per criterion was adopted. The extent of publication bias could not be assessed in this review.

3.4. Findings

In total, 7231 articles were retrieved across the different databases. After removing duplicates, 5794 articles remained of which 52 were considered for full-text review. Eleven studies met the inclusion criteria and were included in this review. One paper was excluded because it was about the same study but written for different purposes. The remaining studies were excluded, either because they included no intervention or were not specific to PSC but were somewhat related to other topics like job satisfaction, teamwork, and burnout. Other articles were also excluded because they were conference abstracts, poster presentations, did not specifically cover maternity, or were focusing on discussing the concepts, definitions, or theories related to PSC (see Appendix 6 for a list of excluded

papers). Figure 3.1 summarises the search strategy and selection process using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements (Liberati et al. 2009; Moher et al. 2009).

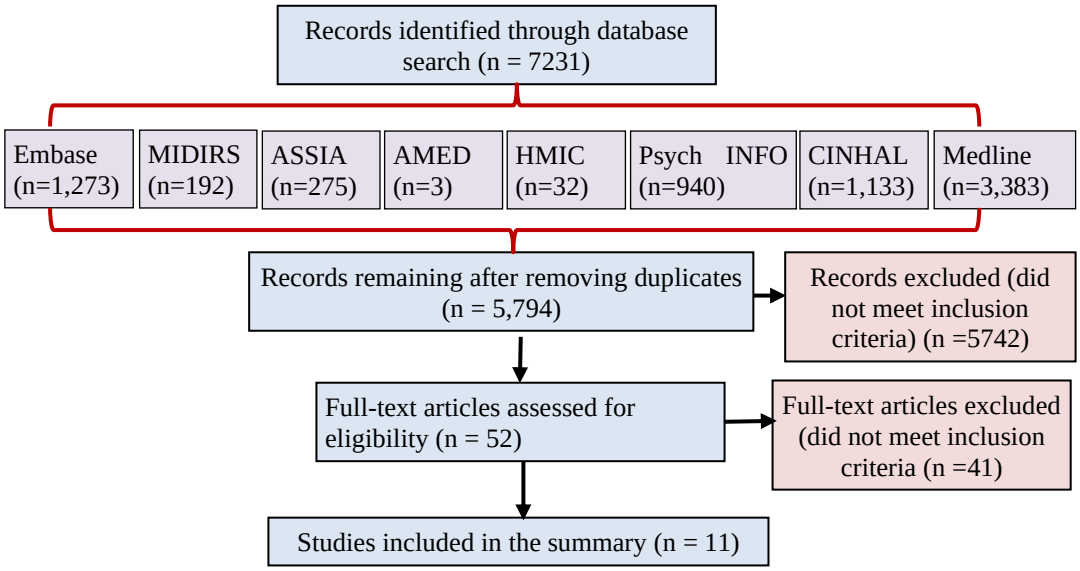

Figure 3.1: PRISMA Flow chart of search strategy and selection process

3.4.1. Quality of reporting

When the included studies were critically assessed against the Centre for Evidence Management checklist, none of the studies met all the criteria. Thus, none of the studies scored 100%. The study by Simpson et al. (2011) had an exceptionally low score (30%). Most studies did not report pre-study considerations of sample size and power (Appendix 5).

3.4.2. Types of interventions

Table 3.2 summarises the intervention types, duration, cost, and effectiveness. The types of intervention used to improve safety culture in maternity can be classified into single intervention and multiple interventions (two or more interventions were used). Out of the 11 studies, six studies used a single intervention in the form of a training programme. The duration of the training program ranged from a few weeks and two years depending on the

number of staff involved and the number of sites undertaking the project. For example, the research conducted by Marzolf et al. (2015) involved 58 participants on one site for five weeks where two lectures were conducted each week while Shoushtarian et al. (2014) conducted a one-day training programme for two years in eight hospitals.

Similarly, the length of the training programme in the single-intervention studies varied from two hours (Burke et al. 2013; Marzolf et al. 2015) to two days (Haller et al. 2008) depending on the contents and type of the training programme. The contents of the training programmes varied greatly. For example, Haller et al. (2008) adopted a crew resource management training programmes where participants were shown a film containing maternity-related critical situations in a busy day followed by lectures aiming to improve their understanding on patient safety and improvement methods. Marzolf et al. (2015) used an educational training curriculum where participants were exposed to lectures, case studies, and hands-on simulations about maternity related topics including antepartum haemorrhage, preeclampsia, neonatal resuscitation, basic ultrasound and many others.

Five studies used multiple interventions to improve safety culture with varying duration. For example, the project by Raab et al. (2013) was launched in 2004 on three sites and continued untill 2010 in one of the hospitals. They used a number of interventions like recruiting an expert to review the practice, adopting a national nomenclature to interpret fetal heart tracings, requiring all staff responsible for fetal heart monitoring to demonstrate competency by earning a national certificate, and establishing a team training programme. Similarly, Pettker et al. (2011) introduced multiple interventions over four years including outside expert review, protocol standardisation, creating a patient safety nurse position and a safety committee, and team training skills. Interestingly, all the multiple intervention studies included a training activity in their programme.

Table 3.2: Summary of intervention types, duration, cost and effectiveness

Author	Intervention						PSC improved
	Duration	Type		Cost	Design	Measure- re-measure duration	
		Single	Multiple				
(Burke et al. 2013)	3 months	Yes		Nurses attendance = $6300. Obstetricians= $12,000	Cross sectional	April 2010–November 2011=20 months	Yes
(Haller et al. 2008)	14 months	Yes		NR	Cross-sectional	Over 1 year of programme=12 months	Yes (negative in second period)
(Marzolf et al. 2015)	5 weeks	Yes		NR	Cross-sectional	Three months (few weeks before the training and few weeks after it)	Yes
(Miller et al. 2008)	12 months	Yes		NR	Cross-sectional	Several months after the event. Fall 2005-fall 2006 = 12 months	Yes
(Pettker et al. 2011)	4 years		Yes	Initial $210,000, and yearly costs of $150,000.	Cross-sectional	2004 – 2009 yearly basis	Yes
(Pratt et al. 2007)	4 months	Yes		NR	Cross-sectional	NR	Yes
(Raab et al. 2013)			Yes	NR	Cross-sectional	Two years 2008 - 2010	Yes
(Riley et al. 2011)	Sept 2007 to February 2008		Yes	NR	Randomised clinical trial	Before and after a one-year period of intervention	No
(Shoushtarian et al. 2014)	2 years	Yes		NR	cohort study	NR	Yes
(Simpson et al. 2011)	11 months		Yes	NR	Cross-sectional	Seven months: Monthly measurement but the first two months were compared with the last two months	Yes
(Wagner et al. 2012)	August 2007 to July 2009		Yes	NR	Cross-sectional	Before and 18 months after project	Yes

3.4.3. Effectiveness of intervention

Nine studies used a cross-sectional design, one used a controlled trial design, and one used a retrospective cohort design. Ten studies used the Safety Attitude Questionnaire (SAQ) developed by Sexton et al. (2006) to measure safety culture while only one study used the Hospital Survey on Patient Safety Culture (HSOPSC) developed by the US Agency for Health Care Research and Quality (US AHRQ) (Nieva and Sorra 2003). Eight cross-sectional studies compared safety culture before and after the intervention in the same unit while Pratt et al. (2007) compared improvement in safety culture with the rest of the hospital units. The duration between the initial assessment and the re-measurement of PSC varied from three months (Marzolf et al. 2015) to 2 years (Raab et al. 2013). However, Pettker et al. (2011) measured PSC on an annual basis throughout the four-year programme in order to assess improvement levels and to ensure that these improvements were sustained.

Nine studies out of 11 (82%) reported that the overall PSC level or some of its domains had improved significantly after the interventions. Interestingly, the significant improvement reported by Pettker et al. (2011) was sustained and continued throughout the four years of the project. Similarly, the retrospective study by Shoushtarian et al. (2014) observed that PSC had improved at the seven sites where the training programme was being implemented while no significant improvement was noticed at the eighth site where no intervention had taken place. However, two studies showed that there was no change or that the improvement was not significant. The cross-sectional study by Haller et al. (2008) found a negative change eight months after starting the programme but had an overall positive PSC level by the end of the one-year programme. The authors attributed the

negative change to the increased workload in the summer period when many staff members were on holidays.

Additionally, the randomised clinical trial by Riley et al. (2011) found that during the two-years project there was no change in the PSC for either the control-hospital or the hospitals with partial-intervention while the full-intervention hospital showed an improvement in one domain of safety culture (teamwork climate). They attributed their findings to the fact that PSC bassline level was high at the three hospitals and had reached its potential ceiling effect. Additionally, they discussed the possibility that more time and more training were needed before re-measuring PSC. Along with PSC level, ten studies used other indicators to measure the effectiveness of their interventions such as participants' satisfaction and participants learning (Haller et al. 2008), 10-obstetric specific outcomes (Pettker et al. 2009), and Adverse Outcome Index (Pratt et al. 2007; Wagner et al. 2012; Marzolf et al. 2015). Generally, most of the other indicators have improved following the interventions.

3.4.4. The cost of intervention

None of the included studies reported the cost of assessing PSC, and only two studies reported the cost of the intervention. Burke et al. (2013) reported that $6300 were paid for nurses to attend the two hours training and $12,000 paid to physicians for presenting in the programme. However, physicians and midwives attending the programme had not been paid and their time away from the clinic was not included in the cost estimates. It is worth mentioning that these costs do not cover the cost of training or the cost of the other interventions used in the study. The study by Pettker et al. (2011) had an initial cost of $210,000 and a yearly cost of $150,000 without specifying how these costs were divided

or estimated. The authors claimed that, although the cost of the interventions may be challenging to low-resourced organisations, it outweighs the cost of liability claims.

3.5. Discussion

This chapter has shown that there is a wide range of interventions that can be used to improve PSC in maternity units. These interventions have varied in terms of volume (single vs multiple), duration (a few weeks to two years), content, and length (two hours to two days). This variation in the breadth of interventions (in terms of contents and duration) to improve patient safety culture was also found by Weaver et al. (2013a) in their systematic review. A possible explanation for this variation could be the non-consensus in defining patient safety culture. Another possible explanation could be that researchers had an aim improve patient safety and clinical processes in addition to improving patient safety culture. Thus, the interventions used were aiming to improve both, patient safety and safety culture. However, none of the included studies explicitly stated which intervention was aiming to improve which aspect. For example, education as an intervention was sometimes used to improve communication and handover but sometimes used to improve knowledge about a specific clinical condition.

Although there was no clear understanding about how a specific intervention impacts on safety culture and on patient safety, evidence supports that staffs' perception shapes their willingness to practice safety procedures which will translate into patient outcomes (Weaver et al. 2013a). Nevertheless, studies aiming to improve patient safety culture should be cautiously interpreted because patient safety culture is a complex concept and understanding the factors influencing it is not as easy as might be expected (van Noord et al. 2010).

Although two studies showed a negative or no change in PSC, the accumulative evidence from the other nine studies supports the feasibility of improving PSC and the effectiveness of the different strategies in enhancing PSC level in maternity units. However, the relative impact of each intervention on PSC, especially in the multiple-intervention studies, was not examined and the extent to which this success rate reflected positive publication bias is not clear. Additionally, the costs of the intervention reported by the two studies questions the affordability of hospitals in undertaking such an intervention especially if we know that the reported costs may not have covered all the costs such as costs of measurement and costs related to staff absenteeism from their duties. Thus, more rigorous evaluation in terms of controlled comparisons and health economic evaluation is needed.

It is worth emphasising that even with a comprehensive set of interventions; a change in PSC is not to be expected within a few days after the intervention. It can be seen that although most researchers agreed on the importance of a baseline PSC level before starting any intervention, the time period for follow-up measurement of PSC varied from three months (Marzolf et al. 2015) to 2 years (Raab et al. 2013). This issue is further complicated by the reality that most hospitals (including maternity units) frequently undergo changes of protocols, policies, staffing and many other factors that act as confounding factors affecting the results of PSC especially if re-assessment was conducted after a long period from the baseline (Haller et al. 2008).

Patient involvment in the planining or designing of an intervention was not reported by any of the studies included in this review. Given the importance of patient centred care in maternity and the feedback that patients can provide in respect of quality and safety, incorporating patients in the enhancement of PSC should be considered by future work (BAKER et al. 2005).

3.6. Limitations of this review

The screening of the papers was conducted by a single reviewer which may increase the chance of bias in selecting the related studies. Grey literature was not considered in this review. Additionally, it is possible that where results were inconclusive or were negative, researchers may have not made an attempt to publish their studies or they were not accepted for publication. This introduces a potential threat for publication bias especially for studies where interventions to enhance PSC proved less successful. Nonetheless, the general conclusions relating to the measurement of PSC are unlikely to be undermined by this.

3.7. Recommendations for future studies

Future studies need to determine how often PSC surveys should be undertaken for monitoring purposes, how soon PSC should be re-examined after an intervention. Intervention studies should be more rigorously evaluated using controlled comparisons when possible along with economic evaluation.

3.8. Conclusions

The measurement and enhancement of patient safety culture in maternity units is increasingly important and feasible. The costs of measuring patient safety culture have been underreported. A wide variety of interventions to enhance patient safety culture were reported but have not been rigorously evaluated. Future studies should also report the costs of measuring patient safety culture and adopt more rigorous evaluation designs.

Chapter 4

Satisfaction about childbearing: a review of Arabic surveys

The material presented in this chapter is accepted and published as:

Al Nadabi, W. and Mohammed, M. A. (2019) Arabic Language Surveys Measuring Mothers' Satisfaction During Childbirth: A Review. Global Journal of Health Science 11 (6) 169

4. Chapter four: Satisfaction about childbearing: a review of Arabic surveys

4.1. Abstract

Mother's satisfaction with childbearing is an indicator of quality. Little is known about the surveys used to measure maternal satisfaction in Arabic speaking countries. This chapter aimed to review Arabic surveys used to measure maternal satisfaction. Peer-reviewed studies published in English and Arabic since 2000 were reviewed across eight databases. Surveys were assessed by: survey construction, reliability, and validity. The seven studies that met the inclusion criteria were in written in English and included seven different Arabic surveys. Survey items ranged from eight to 32 and were translated from English (3/7) or were originally written in Arabic (4/7). Six surveys were pilot tested. Domains covered by the surveys varied but all measured satisfaction about providers' interpersonal care. Internal reliability was reported for four surveys and none reported the test-re-test results. Three studies reported content validity, one reported face validity, one reported construct validity, and none reported criterion validity. Participants' inclusion criteria varied but all studies excluded women with still births or obstetric complications. When surveyed within hospital (3/7), participants were approached within 72 hours after delivery while those surveyed outside the hospital (4/7) were approached two weeks, seven weeks, or two months after discharge. Overall, the eight-item survey was found short, well tested with good psychometric properties. In conclusion, the psychometric properties of Arabic surveys were determined in limited settings, were not well reported, and varied. The eight-item survey is a well-tested survey with good psychometric properties. Furthermore, rigorous evaluation of Arabic surveys in different contexts with wider inclusion criteria is required.

4.2. Introduction

Childbearing is the most common reason for utilising health services, and the continual measurement and enhancement of the quality and safety of maternity care is a global concern (Hodnett 2002). Women's satisfaction with the care received during childbirth delivery is an essential indicator of the quality of maternity care. Satisfaction with maternity care is linked to positive outcomes for the mother and child, affects how users seek medical assistance, and improves their compliance with medical advice (Carr-Hill 1992; Draper et al. 2001; Harvey et al. 2002). Unsatisfactory childbearing experience, on the other hand, is associated with post-partum depression, post-traumatic stress disorder, and can probably lead to extreme stress (Goodman et al. 2004). Measuring maternal satisfaction helps clinicians and decision makers to assess the quality of care provided, to make decisions about how care should be provided, avoid legal consequences of negligence, and to show commitment to involve women in planning their care (Sitzia and Wood 1997; Crow et al. 2002; van Teijlingen et al. 2003; Gungor and Beji 2012)

4.2.1. What is patient satisfaction?

Although many researchers emphasise the importance of measuring patient satisfaction, there is no consensus on the definition of satisfaction, the factors that affect satisfaction and the best tools to measure satisfaction. The lack of consensus can be explained by the fact that patient satisfaction is a complex, multidimensional construct that is subjectively (not objectively) evaluated by those who received care (Carr-Hill 1992; Crow et al. 2002; Harvey et al. 2002). Despite these challenges, Crow et al. (2002) argue that patient satisfaction remains an important indicator of the quality of care and its measurement is growing in different parts of the world. The authors state that the word 'satisfaction' is derived from Latin - meaning 'enough' which indicates two key characteristics. First,

when a patient is satisfied, it means that an acceptable (enough) level of care has been received. Second, measuring satisfaction can only be accomplished by taking into account the expectations/needs of the patients. Ware et al. (1983) defined satisfaction as '"*personal evaluation of healthcare services and providers'* while Linder-Pelz and Struening (1985) defined it as *'multiple evaluations of distinct aspects of healthcare which are determined (in some way) by the individual's perceptions, attitudes and comparison processes'*.

Several factors were found to be associated with childbirth satisfaction. Examples of these factors include labour pain, personal control, expectation, and preparation (Goodman et al. 2004). It was found that mothers who had less pain, who had control over their care, whose expectations were met, and who were emotionally prepared were more satisfied compared with women who experienced severe labour pain, had no control, expectations had not been met or who had not been prepared. Other factors associated with childbirth satisfaction include the amount of support from caregivers, caregiver-patient relationship, and involvement in decision making (Hodnett 2002). There is a contradictory evidence regarding the association between demographic factors (e.g. educational level, age, ethnicity, number of pregnancies, *etc.*) and childbirth satisfaction (Goodman et al. 2004).

4.2.2. How to measure satisfaction?

There are several approaches to measure patient satisfaction such as surveys, interviews, focus group discussions, critical incident analysis, recording and monitoring complaints, matron rounds, telephone calls, and ward meetings (Carr-Hill 1992). Whilst each of these methods has its strengths and limitations; surveys are perhaps the most popular method for measuring satisfaction especially as surveys are relatively low cost, high volume, and can be used objectively and practically to measure the change in satisfaction over time

(Sitzia and Wood 1997). Interviews and focus group discussions can provide an in-depth information from participants (Crow et al. 2002) but compared with surveys, they are usually undertaken with smaller groups and so their results are less likely to be generalisable.

A number of systematic reviews have considered the use of surveys for measuring women's satisfaction level with maternity care. The systematic review by Perriman and Davis (2016) looked explicitly at surveys used to measure satisfaction of mothers with continuity of care in maternity care. They identified four surveys which had varying degrees of reliability and validity. Similarly, Sawyer et al. (2013) reviewed the literature for surveys that were used to examine the mother's satisfaction with care during labour and birth. They found nine surveys with varying levels of psychometric properties. Interestingly, both reviews agreed that the six simple questions developed by Harvey et al. (2002) is an easy tool to use and has good reliability and validity. Additionally, both reviews concluded that there is a need for a reliable, brief, and valid tool to measure maternal satisfaction.

Despite the extensive work related to the satisfaction of mothers with maternity care, little is known about surveys in the Arabic language designed to measure satisfaction. There are 26 countries where Arabic is officially recognised by the government, with 18 having a majority of their people using it as their first language (Worldatlas 2018). A recent review by Hussein et al. (2018) examined studies related to satisfaction in the Middle East. They did not assess the quality of the surveys but instead focused on identifying components of satisfaction. In addition, their review included Arabic and non-Arabic surveys.

This chapter aims to undertake a review of surveys available in the Arabic language that have been used to measure the satisfaction of women about their care during childbirth.

The specific objectives of this review were (a) to describe the different surveys used to measure satisfaction, (b) to report the quality of these surveys, and (c) to examine the different domains of satisfaction measured by these surveys.

4.3. Methods

A narrative literature review was followed which is according to Booth et al. (2012), a type of review where the literature is reviewed comprehensively and systematically. This methodology allows the reviewer to descriptively summarise different study designs using summary tables. Additionally, it helps to identify any gaps in the literature. However, narrative reviews are criticised for being less useful in identifying commonalities (Lucas et al. 2007). Unlike systematic review where a specific question is examined with an aim to provide a clear answer, narrative reviews are usually used to provide a general overview about the existing knowledge about the topic and to guide the formation of follow up research questions (Pae 2015).

4.3.1. Review protocol

See Table 4.1 for the review protocol

Table 4.1: Review protocol

	Inclusion criteria	**Exclusion criteria**
Population	Post-partum Arabic women in Arabic countries	Pregnant women
Intervention	Assessment of satisfaction	Assessment of knowledge or awareness or views about a test or abortion
Comparator	None	
Outcomes	Satisfaction or experience	Knowledge or awareness
Study	Quantitative using a survey	Mixed method, qualitative

4.3.2. Data sources

The search engines used for this literature review were: Cumulative Index to Nursing and Allied Health Literature (CINAHL); Embase; the Health Management Information

Consortium (HMIC); Medline; Psych INFO; Allied and Complementary Medicine Database (AMED.

4.3.3. Search strategy

Search terms were first used in Medline and applied to other databases. The search strategy combined relevant terms as follows: (terms related to maternity care) AND (terms related to satisfaction) AND (terms related to women) AND (terms related to Arabs). Table 4.3 shows the search terms used as keywords in Medline and replicated to other databases.

Table 4.2: Search terms

Search terms for maternity units	**Search terms for satisfaction**	**Search terms for users**	**Search terms for Arabs**
Matern* or midwif*or midwive* or perinatal or postnatal or antenatal or pregnancy or birth or labour or labor	Satisfaction or experience or perception or attitude or views or opinion	user or women or patient	Arab or Arab countries or Arab world or Algeria or Bahrain or Egypt or Iraq or Jordan or Kuwait or Lebanon or Libya or Mauritania or Morocco or Oman or Palestine or Qatar or Saudi Arabia or Sudan or Syria or Tunisia or United Arab Emirates (UAE) or Yemen, or middle east

4.3.4. Inclusion criteria

To be included in the review, studies needed to be peer-reviewed and conducted in Arabic countries and focused on measuring patient satisfaction about care received during childbirth. In addition, studies needed to be using a survey written in Arabic. Search was limited to studies published in English and Arabic on or after 2000. This limitation was set because surveys published or used before this year could be of limited use.

4.3.5. Exclusion criteria

Studies that have not examined satisfaction during childbirth were excluded. For example, studies that examined satisfaction about care during pregnancy, focused on views about labour pain management or focused on breastfeeding, abortion, or family planning were

excluded. Additionally, qualitative studies, theses, and grey literature were not considered for this review.

4.3.6. Data extraction and quality assessment

Data extraction and data synthesis were performed simultaneously using tables to summarise key information and results. The quality assessment of surveys was guided by the criteria used by Sawyer et al. (2013) whereby three main categories were used: survey construction (item generation and pilot testing), reliability (internal consistency and test-retest), and validity (face, content, criterion, and construct). The detailed items under each criterion and its description can be found in their paper. In this review, the quality assessments of the surveys are described as reported by the authors. However, if the survey used was translated from an English tool, an attempt is made to retrieve the original article describing the tool. Thus, it will be noticed that two Cronbach Alpha values might be reported for the translated survey, one value for the Arabic version and the other one for the English version.

4.4. Findings

Conducted in March 2018, a total of 1211 articles were retrieved across eight databases. After removing duplicates, 924 articles remained. The remaining articles were scanned for eligibility through the title and abstract. Out of 23 articles considered for full text review, only seven studies were included and the remaining 15 studies were excluded (See Appendix 7 for a list of excluded articles and the reason for exclusion).

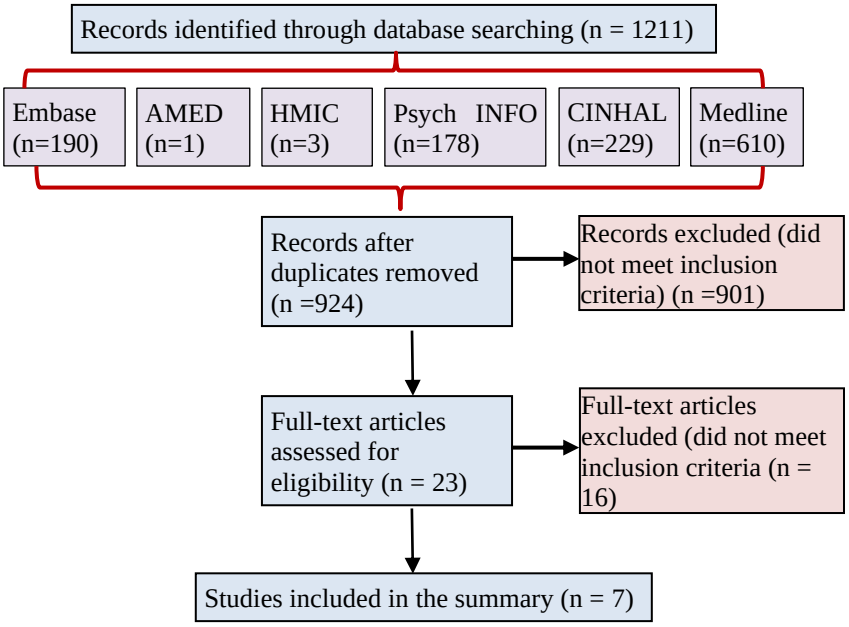

Figure 4.1: Search strategy and selection process PRISMA flow chart

One study that was considered for full text review was excluded because the full text was not accessible even after contacting the author (Monazea and Al-Attar 2015). The seven studies included used different surveys resulting in seven different surveys. Figure 4.1 summarises the search strategy and selection process using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements (Liberati et al. 2009) . The following sections describe the seven surveys found by this review and their psychometric properties.

Table 4.3: Summary of studies included in the review

Author	Country	Participants			Original language	Where surveyed	When surveyed
		Number	Included	Excluded			
(Bashour et al. 2013)	Syria	2000	Women who gave birth to a living baby (vaginal birth or by caesarean section)	Women with difficult labour and high-risk pregnancies	English	Home	2 weeks after delivery
(Kabakian-Khasholian et al. 2017)	Egypt, Lebanon and Syria	2620	Women who gave birth in the hospitals studied	Women classified as high-risk, those who suffered from intrauterine foetal death and those below 18 years	English	Hospital	6 to 48 h after birth
(Mohammad et al. 2013)	Jordan	320	7 weeks post-partum and had a term live baby.	Women who had a stillbirth or preterm baby	English	Convenient location	7 weeks postpartum
(Mosallam et al. 2004)	(UAE)	400	Singleton normal pregnancies delivered vaginally	Women with multiple pregnancy and significant obstetric complications and delivered by caesarean	Arabic	Hospital	Third postnatal day
(Oweis 2009)	Jordan	177	Literate women with a healthy baby, by normal vaginal delivery and assisted delivery	Not explicitly reported	Arabic	Primary health care centres	Not reported
(Rizk et al. 2001)	UAE	715	Women who delivered normal and caesarean section	Women with stillbirth babies, staff in the hospital, or had a history of psychiatric illness.	Arabic	Hospital	Third postnatal day
(Shaban et al. 2016)	Jordan	300	Low-risk women who gave birth to a healthy singleton baby at term	Women who had a stillbirth or neonatal death in their most recent birth	Arabic	Primary health care centres	Within 2 months

UAE: United Arab Emirates

4.4.1. An overview of the included studies (Table 4.3)

Three studies were conducted in Jordan, two in the United Arab Emirates, one in Syria, and another study that was conducted in three countries (Egypt, Lebanon, and Syria). Three surveys were translated from English while the other four were developed in Arabic. The number of participants included in the seven studies ranged from 177 (Oweis 2009) to 2620 women (Kabakian-Khasholian et al. 2017). The timing of distributing the survey to participants varied from 6 hours after discharge (Kabakian-Khasholian et al. 2017) to 2 months after discharge (Shaban et al. 2016). Three studies were conducted at the hospital, two at the primary health care centre, one at home, and one in a convenient place away from the clinic. Almost all studies excluded women who had a stillbirth or obstetric complications. None of the studies included the Arabic version of the survey in their paper. When reported, all surveys used 5 points rating scale. The following sections describe each survey's psychometric properties as summarised in Table 4.4.

Table 4.4: Psychometric properties of the surveys

Author	Survey			Survey Construction		Reliability		Validity			
	Name	N. of items/scale points	Domains	Item generation	Pilot testing	Internal consistency (Cronbach's alpha)	Test-re-test	Face	Content	Criterion	Construct
(Bashour et al. 2013)	Modified Medical Interview Satisfaction Scale	21/5	NR, but focused on Doctor–woman relationship	Literature review	NR (for the Arabic version)	NR	NR	NR	NR	NR	NR
(Kabakian-Khasholian et al. 2017)	Adapted version of the Mackey Childbirth Satisfaction Rating Scale	31/5	Six domains capturing aspects related to self, partner, baby, nurse, midwife, physician, and general rating scale	Literature review	Tested in three sites	0.95	NR	NR	NR	NR	NR
(Mohammad et al. 2013)	Satisfaction with Childbirth Care Scale	8/5	Two domains: interpersonal care by and satisfaction with the information received and involvement in decision-making	Literature review	Tested on 20 women	0.81	NR	20 women	Experts in midwifery and nursing.	NR	NR
(Mosallam et al. 2004)	27-items survey	27/5	Women attitudes and preferences regarding psychosocial support and antenatal preparation, their overall satisfaction	Literature review	Tested on 20 mothers	NR	NR	NR	NR	NR	NR
(Oweis 2009)	Satisfaction with Childbirth Experience	32/5	NR	Literature review	Tested on 30 women	0.88	NR	NR	By three nursing experts	NR	NR
(Rizk et al. 2001)	23-items survey	23/5	Knowledge and perception of childbirth	Literature review	Tested on 20 mothers.	NR	NR	NR	NR	NR	NR
(Shaban et al. 2016)	14-items survey	14/NR	Interpersonal care, satisfaction with information and involvement in decision making, and physical birth environment	Literature review	Tested on 20 women	0.88	NR	NR	By seven clinicians	NR	Items factor loading= 0.53 or more

Note. **NR** = Not Reported

4.4.2. Modified Medical Interview Satisfaction Scale (MMISS)

The MMISS is a 21-item survey covering the doctor-women relationship in delivery rooms. The Arabic version of the MMISS survey was developed by Bashour et al. (2013) to evaluate the training course impact on the communication skills of health care providers as perceived by Syrian women. This survey was given to mothers at home two weeks after delivery. Participants included those who had vaginal and caesarean delivery but excluded women with difficult labour and high-risk pregnancies. The survey was originally developed in the United States to measure satisfaction about communication and was not specifically designed for maternity care. The original version had limited evidence about its reliability and validity but the British modified version of the survey had a good internal consistency with a Cronbach's Alpha ranging from 0.67 to 0.92 (Meakin and Weinman 2002). However, the steps used to translate the tool and the psychometric properties of the Arabic version were not reported by Bashour et al. (2013).

4.4.3. Adapted version of the Mackey Childbirth Satisfaction Rating Scale (MCSRS)

The Arabic version of the MCSRS has 31 items and was developed by Kabakian-Khasholian et al. (2017). The survey covered six domains measuring aspects related to self, partner, baby, nurse/midwife, physician, and general rating scale. The MCSRS survey was used in three different Arab countries: Syria, Egypt, and Lebanon. It was handed to all mothers who gave birth in the participating hospitals just before their discharge but excluded women who were classified as high-risk, those who suffered from intrauterine foetal death, and those below 18 years. The MCSRS was used along with the Labour Agentry Scale (LAS) which was used to assess the perceived control during childbirth. The MCSRS was originally designed by Mackey and Goodman and was found to have strong internal reliability with a Cronbach alpha ranging from 0.7 to 0.97 (Moudi

and Tavousi 2016). Although Kabakian-Khasholian et al. (2017) reported that the Cronbach Alpha for the Arabic version was found to be 0.95, the full text of the cited reference was not accessible and no sufficient information was reported in their paper. Thus, no comments could be made about its reliability, validity or the translation process.

4.4.4. Satisfaction with Childbirth Care Scale (SCCS)

The SCCS is an 8-item survey developed by Mohammad et al. (2013) who surveyed Jordanian women seven weeks after delivery in a convenient location away from the clinic. The seven weeks period was reported by the authors to be as providing an opportunity for mothers to reflect upon their experience. The authors included women who were 7 weeks post-partum and had a term live baby and excluded those who had a stillbirth or preterm baby. The SCCS items covered two domains: interpersonal care (four items) and information received and involvement (four items). The survey was pilot tested with 20 childbearing women before being used in the study. The Cronbach Alpha for SCCS is 0.81, and a panel of experts assessed its content validity while 20 childbearing women assessed the face validity. However, no comments were made about the survey's criterion and content validity. The SCCS was originally written in English, and the back translation process to Arabic was conducted by four scholars to ensure content and semantic validity.

4.4.5. 27-items survey

This survey was developed originally in the Arabic language in the United Arab Emirates (UAE) by Mosallam et al. (2004). The survey items were generated using literature review and were pilot tested on 20 women to assess for clarity and suitability. However, no information was reported about the reliability and validity of the survey. Participating women were surveyed on their third day postnatally excluding those who had had a

caesarean section. The survey covered mothers' views about psychological support and antenatal preparation as well as their overall satisfaction.

4.4.6. Satisfaction with Childbirth Experience (SWCBE)

Oweis (2009) developed this 32 item survey in the Arabic language following a literature review but the domains covered were not explicitly reported. Women who had had a normal or assisted vaginal delivery were included, but women with caesarean section were excluded. It was used in Jordan and was piloted on 30 women to test for clarity. The SWCBE face validity was tested by three nursing experts and it was found to have a good internal reliability with a Cronbach Alpha of 0.88. However, the authors suggested the need for further studies to assess the reliability of the survey on a larger sample size. Additionally, participants were selected based on a convenience sample, and this may affect not only the generalisability of the results but also the psychometric properties of the survey. This survey was used along with another tool (women's perception of control during childbirth) that assessed the perceived control during childbirth.

4.4.7. 23-item survey

The 23-items survey was developed and used by Rizk et al. (2001) in the United Arab Emirates. The survey items were developed following a literature review and were pilot tested on 20 women to assess for clarity and ease of administration. The domains covered by the survey were not reported. Both normal and caesarean delivery women were included in the study. Women were surveyed on their third day postnatally. However, women who had a stillbirth or had a history of psychiatric illness were excluded from the study. The reliability and validity of the survey were not reported.

4.4.8. 14-items survey

Shaban et al. (2016) developed this 14 item survey originally in the Arabic language and used it in Jordan. Participants included were low risk women who gave birth to a singleton health baby but excluded women who had a stillbirth or neonatal death. It measured three domains of care: interpersonal care, information and involvement, and physical birth environment. The items of the survey were informed by a literature review and were tested by 20 women to assess the clarity and readability of the items. It was found to have a good internal reliability with a Cronbach Alpha of 0.88. A panel of seven clinicians assessed the content validity of the survey items. Construct validity was tested and found that no items needed to be removed due to redundancy and all items had factor loading of 0.53 or on at least one factor. The authors reported that participants were surveyed at the primary care centre within two months after delivery. Their rationale for the period was to allow sufficient duration to adapt after delivery but close enough to remember the event.

4.5. Discussion

This review has examined the Arabic language surveys that were used to measure the satisfaction of women about the care received during childbirth in Arab countries. It has shown that there are only seven studies that met the inclusion criteria. These studies were conducted in five Arab countries. Four of these studies used surveys that were originally developed in the Arabic language while the other three were translated from an English survey. The number of participants surveyed in the studies ranged from 177 to 2620. In addition, the criteria used to include or exclude participants were different. For example, Bashour et al. (2013) and Rizk et al. (2001) included both normal and caesarean deliveries while Mosallam et al. (2004), Oweis (2009) and Shaban et al. (2016) included only women who delivered vaginally and had a normal singleton baby. The time period for

conducting the study ranged from 6 hours (Kabakian-Khasholian et al. 2017) to 2 months post-delivery (Shaban et al. 2016).

The SCCS is a short survey (8 items) with a good reliability and has face and content validity. Another relatively short (14 items) and well tested tool that has good psychometric properties is the 14-items survey developed by (Shaban et al. 2016). The SWCBE has a good internal reliability and content validity and it can be used in studies aiming to examine satisfaction and control during childbirth. It should be noted, however, that the timing of conducting the study and the included participants should be taken into consideration before using any of these surveys as the psychometric properties of these surveys might not apply when used at different timings and with different inclusion/exclusion criteria.

Similar to what has been found by Sawyer et al. (2013), the extent to which the surveys were tested for psychometric properties varied greatly. Only four studies reported measures of reliability while face validation was reported by only one study, content validity was reported by three studies, and construct validity was reported by one study. Although the English version surveys were tested for their internal reliability, this does not guarantee that the translated Arabic version would have an equivalent reliability measure (Maneesriwongul and Dixon 2004). Thus, studies aiming to adopt an existing survey in another language should examine the psychometric properties of the survey even if the original survey had an established reliability and validity.

4.6. Limitations of this review

This review has two main limitations. First, as grey literature was not considered in this review, relevant studies might have been missed. Second, important studies published in other databases could have been missed despite the multiple databases used for this

review. However, these findings will promote further research in this area and will help enhance maternal experience with childbearing.

4.7. Conclusion

This review chapter concludes that there are few surveys that are available for use in an Arabic context. Those surveys have varying psychometric properties, have limited inclusion criteria, and were used to measure maternal satisfaction at different stages after childbirth. Decision maker, health care providers, and researchers should consider these properties, the settings under which they were tested, the inclusion/exclusion criteria, and the domains covered before selecting a survey. This review calls for Arabic surveys that are rigorously evaluated in different contexts with wider inclusion criteria that can be used to measure the mother's satisfaction about their childbearing experience.

Chapter five

Understanding performance indicators using statistical process control theory in maternity units: a narrative review

5. Chapter five: Understanding performance indicators using statistical process control theory in maternity units: a narrative review

5.1. Abstract

Statistical Process Control (SPC) is a promising monitoring and improvement tool. However, its specific application in maternity units has not been reviewed. This chapter examined the different indicators used, the types of control charts applied, and the lessons to be learned from previous studies. A systematic literature review was conducted across eight databases. Data extraction tables were developed to summarise the review questions. Out of 940 articles, 26 met the inclusion criteria. Around 46 maternity-related articles were analysed through different chart types but the cumulative sum chart was the most commonly used chart (9/26). There was no standardised tool to construct control chart or to investigate special cause variations. Generally, SPC charts were positively perceived but investigating the special cause variation and appropriately setting control limits were two key challenges to be addressed by future studies. In conclusion, applying SPC charts in maternity units for monitoring and improvement initiatives is both feasible and useful but challenges associated with the use of SPC need to be addressed before making firm conclusions. This review suggests that there is a need to: (a) develop reporting guidelines for SPC charts and, (b) develop a framework for investigating special cause variation. These two tools would help minimise the challenges that might be faced while developing, assessing, and applying control charts.

5.2. Introduction

Measuring quality is an integral step for any quality improvement initiative (Draycott et al. 2010). In the context of patient care, a number of approaches can be used to measure the quality of care, including clinical audits, peer reviews, patient interviews, and incident reporting (Sibanda and Sibanda 2007a; Boulkedid et al. 2010). Despite their potential, these approaches are sometimes criticised for being time consuming, incomplete, and inaccurate (Johnston et al. 2000; Sibanda and Sibanda 2007a). The use of quality indicators is another approach that can be used to measure different dimensions of the quality of care quantitatively. It is believed that introducing indicators to measure the quality of care will support decision making, and will help improve quality by identifying suboptimal care (Boulkedid et al. 2013). The different types of indicators (including structures, process, and outcome) are used for different purposes. For example, they are used to compare performance with others, to measure achievement over time, and to make corrective/preventive actions when problems are noted.

Evidence suggests that indicators can be effective in improving the quality of care in hospitals, but their usefulness may vary considerably across organisations. The effectiveness of indicators in making the intended improvement can be further enhanced by providing feedback reports and improvement plans to different stakeholders (De Vos et al. 2009). League tables and star ratings are tools that have been used to provide feedback information (about indicators) and have been used to rank hospitals' performance. However, there were several critics about league tables and star ratings. Gibberd et al. (2004) argued that these tables are not useful as they do not provide a measurement of the possible gain that can be achieved. In other words, league tables do not guide hospitals on what improvement could be achieved compared to their current performance. Instead, the

author considered indicators as tools that should be used to detect variation of performance and called for the use of Statistical Process Control (SPC) theory to understand this variation. Similarly, Mohammed et al. (2001) argued that the use of SPC theory could overcome the limitations of standard setting exercises, league tables and hypothesis testing. The following sections will briefly discuss the SPC theory and its application in health care.

5.2.1. What is SPC?

Variation is natural to any process even without any intervention and thus, repeated measures may falsely indicate an improvement or worsening in performance if not carefully analysed (Benneyan, Lloyd, & Plsek, 2003). Shewhart's theory of variation classifies variation according to the action required to reduce it (Mohammed et al. 2001). Shewhart identified two types of variation – common cause and special cause. Common cause variation (also called normal variation) is an expected variation attributable to any process operating under stable conditions and therefore mimics "chance" variation. It is an integral part of every process and affects everyone in that process. To reduce common cause variation, intervention/action should be directed at the underlying process. In other words, the whole process needs to be re-designed in order to improve common cause variation. By contrast, special cause variation is an exceptional variation that is not attributable to 'chance causes', but arises from special circumstances and therefore does not affect everyone in that process. Special cause variation requires detective work to identify the underlying cause and then to act on it (Mohammed et al. 2001). Thus, and based on SPC theory, organisations can determine whether a change in performance shown by an indicator is an improvement/deterioration or is just a natural variation. Additionally, by recognising that not every change is an improvement, organisations can

use SPC theory to distinguish whether the change that was introduced to the process has made a real improvement or was just another normal variation (Benneyan et al. 2003).

SPC theory involves the production of a control chart to visualise and differentiate between the two types of variation graphically. Typically, an SPC control chart has three lines that are plotted horizontally: a Central Line (CL), an Upper Control Limit (UCL), and a Lower Control Limit (LCL). The CL is the mean while the UCL and LCL are the control limits that are usually drawn at three Standard Deviations (SD) above and below the mean. If all measurements are "randomly" distributed within the control limits, the process is consistent with common cause variation and it will be termed 'under control' or 'stable'. On the other hand, if the measurement(s) lies outside the limits or exhibit an unusual pattern, the process is said to be consistent with special cause variation and termed 'out of control' or 'unstable' (Mohammed et al. 2001).

As is the case with any other diagnostic test, Shewhart's theory of variation is subject to two kinds of errors. In error 1 a data point is classified as resulting from a special cause variation when, in fact, it results from a common cause variation. In error 2, a data point is classified as resulting from a common cause variation when, in fact, it results from a special cause variation. These errors cannot be eliminated, although Shewhart's choice of three-sigma control limits, compared to two sigma limits, aimed to reduce the chances for these two types of mistakes (Deming 1986). Setting the control limits at 3SD was designed to minimise the chance of both types of errors and to reduce the economic losses as a result of these errors. However, it is impossible to reduce the probability of these errors to zero (Mohammed 2004).

There are different types of statistical process control charts depending on the type of data being charted (e.g. the X bar chart, G chart, T chart, and NP char). In the science of

improvement, data is grouped into count, classification and continuous (Provost and Murray 2011). Count and classification data is also called attribute data which covers data that is qualitative in nature. Examples of attribute data include number of errors, number of non-conformities and number of items that have passed a test. On the other hand, continuous data is also called variable data and covers data that is quantitative in nature. Examples of variable data include time, money, and volume counts. Figure 5.1 is a flowchart developed by Provost and Murray (2011) to guide the selection of the Shewhart chart. It can be seen that C and U chart are used with attribute data while I and S chart are used with continuous data.

Additionally, there are other advanced alternatives to the typical Shewhart chart, such as the moving average chart, Cumulative Sum (CUSUM) chart, and Exponentially Weighted Moving Average. Despite their technical differences, the purpose of each chart is to monitor and improve the underlying process by classifying its variation into common or special cause. For further details on the different types of statistical process control charts, readers should refer to Provost and Murray (2011).

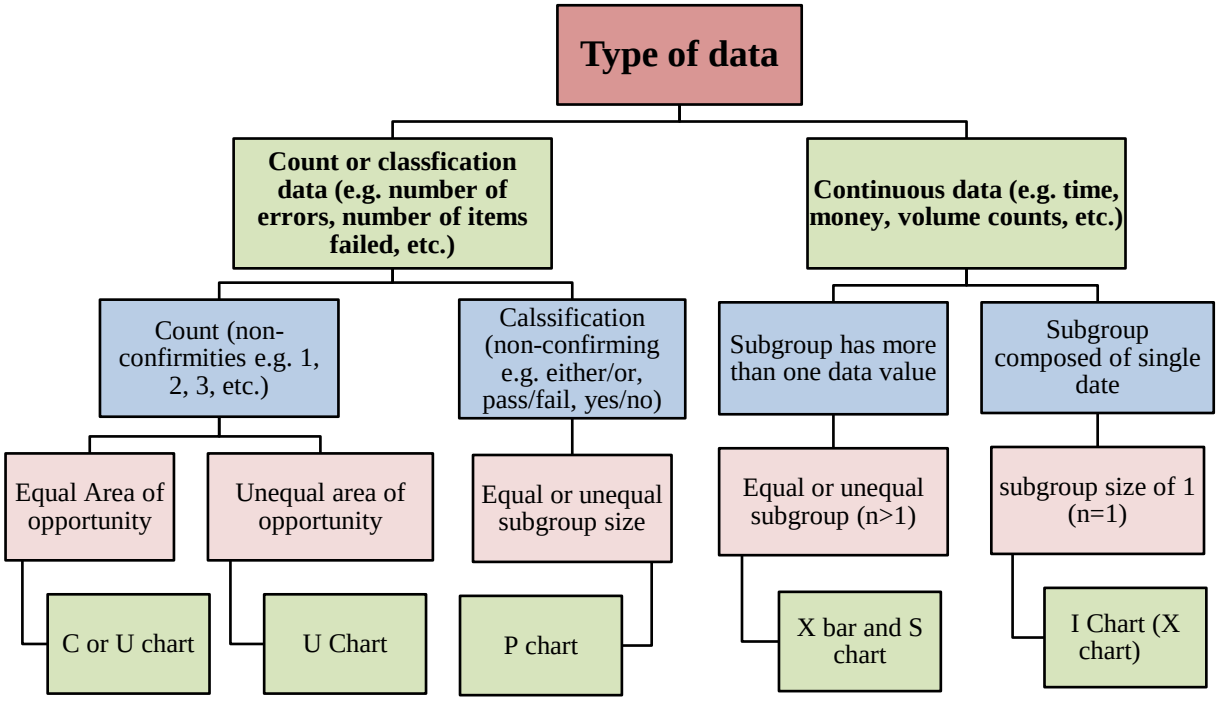

Figure 5.1:A flow chart to guide Shewhart chart selection adapted from (Provost and Murray 2011)

5.2.2. Application of SPC charts in healthcare

SPC was first applied in the manufacturing industries and then transferred to health care settings. Nicolay et al. (2012) reviewed the application of quality improvement methodologies from manufacturing to surgical care. They found that there are a number of methodologies that have been used in surgical settings including continuous quality improvement, six sigma, total quality management, and plan-do-study-act cycle. Most importantly, they concluded that these methodologies can improve different aspects in surgical care such as infection rate and operating room efficiency.

Thor et al. (2007) systematically reviewed the application of SPC in health care. They found that SPC was applied across a wide range of specialities and was used to analyse 97 different variables ranging from individual patient's outcomes, process indicators, and overall organisational performance. Examples of indicators analysed using SPC include patient fall rate, average length of stay after cardiac surgery, and intensive care unit

admission time. They have categorised the benefits, limitations and barriers, and facilitating factors for the effective applications of SPC in health care. One of the critical challenges reported in their systematic review was the proper selection and construction of the control chart. Most importantly, they concluded that SPC helped different stakeholders to manage change and improve quality, not only at the level of health care processes but also at the level of individual patients.

Biau et al. (2007) reviewed the application of CUSUM charts, a type of control chart, across surgical and interventional procedures. They found that the CUSUM charts were improperly reported, tests and plots were wrongly labelled, and control limits were misused. These findings explain their call for standardising the application of CUSUM before expanding its use. In a CUSUM chart, the cumulative difference between successive values and a target values is plotted. These charts are used to graphically represent small persistent changes in a series of consecutive procedures. When the curve in CUSUM charts is flat then an acceptable level of performance is reached while in the case of an unacceptable level the curve slope upward and downwards (Sasikumar and Devi 2014). CUSUM charts have been used to monitor several quality indicators including surgical outcome quality indicators and 30-day mortality (Keefe et al. 2017; Rasmussen et al. 2018). There are different types of CUSUM charts that can be used depending on the specific objective of its use like the observed-expected CUSUM charts and the log-likelihood CUSUM chart (Sibanda and Sibanda 2007b).

A recent review by Suman and Prajapati (2018) found that SPC has been mostly used in surgery, emergency and epidemiology departments. Further, they found that most studies related to SPC in healthcare were conducted in the United States.

As a response to the non-existence of an agreed criterion, Koetsier et al. (2012) conducted a systematic review to summarise methodological criteria (will be called Koetsier Criteria) to construct the Shewhart control charts. In addition, they reviewed the degree of adherence to these methodological criteria. They recommended four criteria: (1) using 10-35 data points, (2) transforming data if the distribution was skewed, (3) using a maximum of four rules to detect special cause variation and, (4) setting the control limits at three SD from the mean. Despite their rigorous approach, the authors declared that their criteria could only fit the Shewhart charts and not the other types like CUSUM charts.

5.2.3. Application of SPC charts in maternity units

Despite the increasing use of SPC charts in a wide range of healthcare specialities, their application in maternity units has not been reviewed. Such a review will help different stakeholders to recognise the potential applications of the control charts whilst highlighting the challenges and limitations of SPC when applied in maternity units.

This narrative review aimed to provide a summary of the applications of SPC charts in maternity units. The specific questions that this review aimed to answer were: (a) what are the different indicators selected and the types of SPC charts applied? (b) What are the different purposes for using SPC in maternity units? And (c) what are the lessons that can be learned from the limitation/challenges as faced by authors?

5.3. Methods

A narrative literature review was followed which is according to Booth et al. (2012), a type of review where the literature is reviewed comprehensively and systematically. This methodology allows the reviewer to descriptively summarise different study designs using summary tables. Additionally, it helps to identify any gaps in the literature. However, narrative reviews are criticised for being less useful in identifying commonalities (Lucas

et al. 2007). Unlike systematic review where a specific question is examined with an aim to provide a clear answer, narrative reviews are usually used to provide a general overview about the existing knowledge about the topic and to guide the formation of follow up research questions (Pae 2015).

Studies included in this review were examined for adherence to the methodological criteria (Koetsier criteria) for constructing SPC charts that was developed by Koetsier et al. (2012). To ensure appropriate application of Koetsier criteria, studies that used CUCUM and funnel plots were not assessed. Additionally, where the type of control chart was not reported (two studies), these studies were excluded. Furthermore, one criterion, the adherence to the use of non-skewed data, was not included in the table because it was not reported by any study that was included in our review. The results of the review were tabulated and discussed thematically.

5.3.1. Review protocol

Table 5.1 below summarises the review protocol.

Table 5.1: Review protocol for searching the use of SPC charts in maternity units

	Inclusion criteria	**Exclusion criteria**
Population	Maternity units, Obstetrics units, Pre and post-natal departments, Midwifery, Community and hospitals	Other health services
Intervention	The use of SPC charts	Other types of charts.
Comparator	None	
Outcomes	Types of charts, perception about feasibility and usefulness of SPC	
Study	Quantitative studies Published in English before 2016	Non-English, Grey literature

5.3.2. Search strategy

The search terms were informed by the systematic reviews conducted by Koetsier et al. (2012) and Thor et al. (2007). Key terms related to SPC charts and maternity units appearing in Medline were first used and slightly modified to suit other databases. The search terms for the different databases are summarised in Table 5.2.

Table 5.2: Search terms for SPC charts

Search terms for maternity units	Search terms for SPC charts
Maternal or maternity or obstetric* or gynecology or gynaecology or reproductive health service* or reproductive care or midwife or midwifery or midwive* or perinatal or postnatal or antenatal or pregnancy	(Control AND chart*) or (quality AND control AND chart*) or (quality AND process AND control) or (statistic* AND control AND chart*) or (statistic* AND process AND control) or (statistic* AND quality AND control)

5.3.3. Search date and update

The search was first conducted in September 2016, and an update search was conducted in November 2018 to check for any new articles published after the initial search.

5.3.4. Sources of data

The search engines used for the initial literature review were: Cumulative Index to Nursing and Allied Health Literature (CINAHL), Embase (not Medline), the Health Management Information Consortium (HMIC), Medline, Psych INFO, Allied and Complementary Medicine Database (AMED), Applied Social Sciences Index and Abstracts (ASSIA), and Maternity and Infant Care Database (MIDIRS). Additionally, the reference lists of the included studies were scanned and studies that met the inclusion criteria were included in the review. The update search used the same search terms and the same databases except for the HMIC and MIDRIS because by that time subscription was discontinued by the University.

5.3.5. Inclusion criteria

To be included, studies needed to be peer-reviewed and to have used SPC charts in maternity services including midwifery, obstetric and labour services. All purposes of using SPC charts (whether monitoring or improvement) were included in the review. No limitation was made for the year publication.

5.3.6. Exclusion criteria

Studies that discussed the concept or the methodology of constructing SPC charts were excluded. Additionally, thesis and conference papers were also excluded from the review.

5.4. Findings

A total of 940 articles were retrieved (from initial and updated search). After removing duplicates, 892 remained which were scanned through the title and abstract. After excluding the articles that did not meet the inclusion criteria, 173 studies were considered for full text review of which 24 studies were included in the final review. The remaining studies were excluded because they discussed the concepts of control charts, used control charts as an illustration, or they were not conducted in maternity care units. Examples of excluded articles and the reason for exclusion are presented in Appendix 8. An additional two studies were handpicked after scanning the reference lists of the 24 studies. Thus, a total of 26 studies were included in the review. The search strategy and selection process are summarised in Figure 5.2 using the Preferred Item for Systematic Reviews and Meta-analysis (PRISMA) statements (Liberati et al. 2009; Moher et al. 2009).

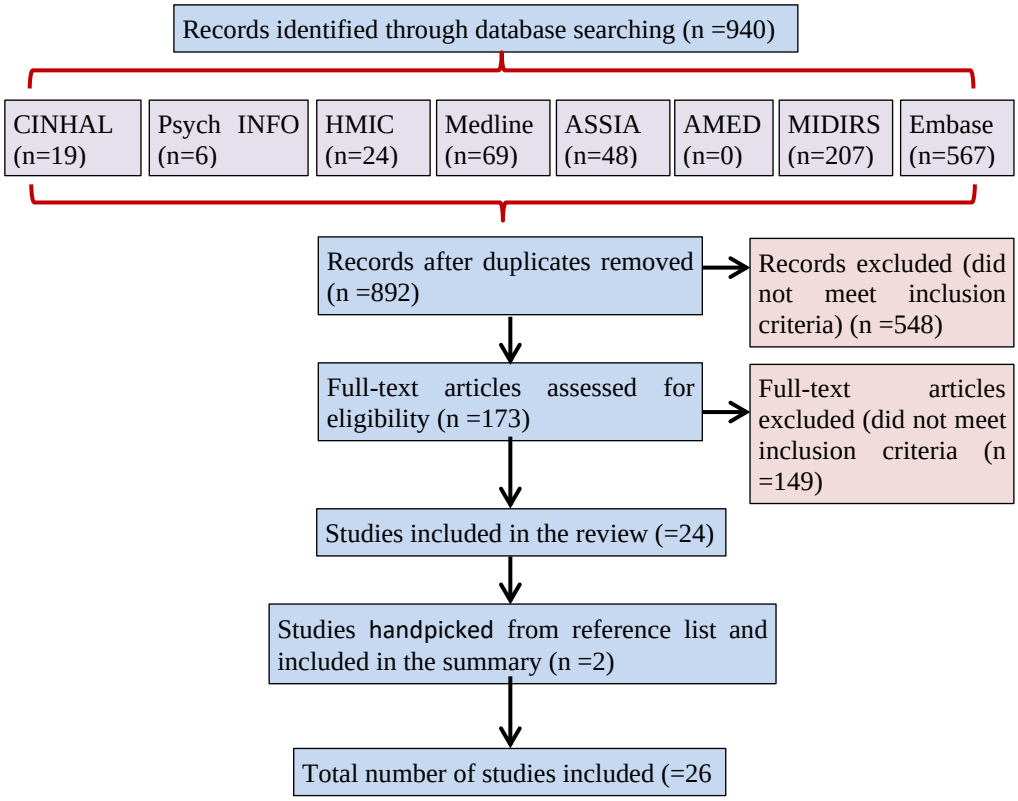

Figure 5.2: PRISMA flow chart of search strategy and selection

5.4.1. Year and country of publication

The earliest study was published in Australia in 1979 while the most recent was published in 2018. The included studies were mostly published in the United States (8 out of 26). The other studies were published in different countries such as Australia, the United Kingdom, Spain, Netherlands, Switzerland, Ethiopia, and Norway. Almost all studies were published during the last 10 years (see Table 5.3).

5.4.2. Types of charts, variables used, and objectives of using SPC charts (see Table 5.3)

Types of chart

Different indicators were monitored using different types of control charts including G charts, P charts, XMR chart, funnel plots, and others. Chang et al. (1979), Frøslie et al. (2011) and Alemi et al. (2012) did not report the type of control chart used. The most commonly used was the CUSUM chart, where 9 out of the 26 studies used this type of

chart. Furthermore, different types of CUSUM charts were used like the Likelihood Ratio CUSUM (LR-CUSUM), Learning Curve CUSUM (LC-CUSUM), two-sided log likelihood CUSUM and Observed-Expected CUSUM (O-E CUSUM). The findings that CUSUM were the most commonly used charts is in line with the argument made by Biau et al. (2007) who noted that CUSUM attracted most of the attention compared with other types. The widespread use of the CUSUM chart was explained by its ability to take into account the case mix when used to monitor an indicator on a patient by patient basis. Although authors defended the use of control charts by the existing evidence of its usefulness, no study (except for CUSUM charts) explained the reason for selecting a specific type of chart or why other types were not appropriate for the variable that was selected.

Indicators used

A total of 46 variables were monitored in the included studies. The 46 variables covered both process indicators (e.g. HIV testing rate, and waiting time) and outcome indicators (e.g. patient satisfaction, the rate of caesarean section, and surgical wound infection). Additionally, variables covered different dimensions of quality including safety (wound infection, surgical site infection), patient experience (waiting time and patient satisfaction), accessibility (proportion of postpartum women visited by skilled providers), and competency of professionals (sonographic fetal weight estimation, nuchal translucency measurements, accuracy of gestational age recording, individual operator performance, and fetoscopic laser photocoagulation). It is worth mentioning here that competency of professionals was assessed through CUSUM charts.

The majority of authors provided no clear methodology for selecting a specific indicator. Boulkedid et al. (2010), however, used systematic literature review and formal judgement

by senior physicians as a means for selecting indicators. In fact, they argued that the selection of quality indicators should be the first step in any quality improvement initiative. Lane et al. (2007) discussed a few criteria that should be used when selecting the variables. They emphasised that the variable (indicator) should be common, routinely collected, accurate, and a measure of quality.

Objective of using control charts

The objectives of using control charts can be classified into (a) monitoring (assessment) and, (b) improvement. Out of the 26 studies, 13 were aiming to monitor the current level of quality. The remaining 13 studies used SPC to examine the effectiveness of interventions to improve the current level of performance. Different types of interventions were used (e.g. training, audit meetings and feedback, education, *etc.*) but most interventions were multifaceted.

Table 5.3: type of chart, variable, objectives and country of publication

Author	Type of chart	Variable	Country	Intervention	
				Yes	No
Alemi et al. (2012)	Not reported	Rate of dissatisfaction (number of days till next complaint)	US		√
Baghurst (2013)	Likelihood Ratio CUSUM	Third and fourth-degree tear after vaginal delivery	Australia		√
Balsyte et al. (2010)	Learning curve CUSUM), double CUSUM	Sonographic fetal weight estimation	Switzerland		√
Boe et al. (2009)	XMR chart	Waiting time and Patient satisfaction	US	√	
Boulkedid et al. (2010)	CUSUM	19 variables	France		√
Chang et al. (1979)	Not reported	Values of urinary oestriol excretion	Australia		√
Comas et al. (2011)	CUSUM	Nuchal Translucency measurements	Spain		√
Drykorn et al. (2012)	G-chart	Rate of caesarian section surgical wound infection	Norway	√	
Dupont et al. (2014)	P-chart	Severe Post-partum haemorrhage after vaginal delivery	France	√	
Frøslie et al. (2011)	Not reported	Fasting Blood glucose level in pregnant women	Norway		√
Groome (2010)	C, P, X, S-chart	Waiting time in clinic (+ number of patients and proportion of new patients)	US	√	
Groome et al. (2009)	P-chart	Rate of incorrectly coded Non-Stress Test and Ultrasonic Biophysical Profile	US	√	
Hollesen et al. (2018)	G chart, Run chart	percentage of new-borns with asphyxia	Denmark	√	
Johnson et al. (2016)	P-chart	30-day surgical site infection (superficial incisional and organ/space infections)	US	√	
Kamath et al. (2012)	Run chart	The accuracy of Gestational age recording	US	√	
Lane et al. (2007)	Funnel plots	Rate of failed ventouse delivery and rate of amniocentesis procedures	UK		√
Mduma et al. (2018)	CUSUM	Fresh stillbirths and early (24-h) new-born survival.	Tanzania	√	
Mukhtar-Yola et al. (2018)	NR	Birth asphyxia	Nigeria	√	
O'Brien and Pillai (2017)	P chart	Percentage of Uterine perforation	UK		√
Papanna et al. (2011)	CUSUM and LC-CUSUM	Learning curve for fetoscopic laser photocoagulation (FLP)	US		√
Peeters et al. (2014)	Learning curve CUSUM	Individual operator performance, double perinatal survival at 4 weeks	Netherlands		√
Prairie and Foster (2010)	P-Chart	HIV testing rate	US	√	
Sibanda and Sibanda (2007a)	O-E and 2 sided Log Likelihood CUSUM	Apgar score	UK	√	
Takahashi (2016)	X–R chart	Hourly number of live births	Japan		√
Tesfaye et al. (2014)	C-chart	the proportion of postpartum women visited by a skilled provider or health extension worker within 48 hours of birth	Ethiopia	√	
Twijnstra et al. (2014)	Risk Adjusted CUSUM	Blood loss, Operative time and adverse event in laparoscopic hysterectomy	Netherlands		

CUSUM: Cumulative Sum

5.4.3. Learning lessons, limitations, and challenges in applying CC

Construction of SPC charts

Koetsier criteria were used to examine the appropriateness of constructing SPC charts. It should be clear that the tool was developed and applied for the Shewhart charts only. The authors who developed the criteria (Koetsier et al. 2012) did not list the type of Shewhart charts that were included in their review. After retrieving and reviewing back the list of studies that they have included, it was found that the types of SPC charts used in their review were similar to the types included in this review. In their review, the charts included were: Run chart, XMR chart, P-chart, U-chart, X bar chart, C-chart, np-chart, and S-chart.

Out of the 13 studies that were examined for adherence to Koetsier's tool, seven adhered to the use of 3 SD when constructing the control limits, one study used a single SD, and five studies have not reported. With regard to the rules for detecting special cause variation, eight studies adhered to using a maximum of 4 rules, while one did not adhere, and four have not reported. The use of 10-35 data points was adhered to by nine out of the 13 studies. Nine studies reported the process stability and the remaining four studies did not report it. However, the study by Dupont et al. (2014) reported the process stability during the intervention phase and not the planning phase, which is against the guidelines of using the SPC theory (see Table 5.4).

Table 5.4:Adherence to Koetsier's tool

Author	**Type of control chart**	**Type of study**		**Control limits constructed**				**Rules for detecting Special cause variation**			**Number of data points used**			**Process stability was studied (yes/No)**		
		Longitudinal	Cross-sectional	3 SD	2 SD	1 SD	NR	Adhered to using maximum of 4 rules	Not adhered	NR	Adhered to 10-35 points	Not adhered	NR	Yes	No	NR
(Boe et al. 2009)	XMR chart	√					√		√ 5 rules		√			√		
(Drykorn et al. 2012)	G-chart	√					√			√	√					√
(Dupont et al. 2014)	P-chart	√				√		√ one rule			√			√		
(Groome 2010)	C-Chart P-chart X-chart S-chart	C- √ P- √ X- √ S- √		√				√ 2 rules			√			√		
(Groome et al. 2009)	P-chart	√		√				√ one rule			√			√		
(Johnson et al. 2016)	P-chart	√		√						√	√					√
(Kamath et al. 2012)	Run chart	√					√	√				√ 6 for baseline and >35 post intervention		√		
(Prairie and Foster 2010)	P-Chart	√					√	√ one rule			√			√		
(Tesfaye et al. 2014)	C-chart	√		√				√ two rules			√			√		
(Hollesen et al. 2018)	G, P, and run chart	√		√				√ two rules				√ eight points above baseline		√		
(Mukhtar-Yola et al. 2018)	NR	√		√						√			√	√		
(O'Brien and Pillai 2017)	P chart	√		√						√	√		√			√
(Takahashi 2016)	X–R chart	√						√				√				√

NR: Not Reported

Analysis of special cause variation

Although most studies attempted to explain the existence of a special cause variation, a few studies had a point outside the control limits but no comment/analysis was made in the text. For example, the control charts in the studies by Drykorn et al. (2012) and Johnson et al. (2016) had a point falling outside the control limits but this was not discussed or investigated.

An important finding of the review is that no standardised tool/approach was used to investigate the special cause variation. Groome (2010) used root cause analysis where a number of possible factors (patient, physician, and system) were discussed with the office staff. Comas et al. (2011) declared that the measurements drifted over time due to 'explained and unexplained' reasons without providing further analysis. Although Lane et al. (2007) recognised the existence of a special cause variation, this was not investigated. Instead, the authors provided possible causes that needed to be examined like: inaccuracy of data, case mix, and competency. Similarly, Peeters et al. (2014) suggested that the special cause variation could be due to technical skills and case mix during the study period. As their study was conducted retrospectively, Sibanda and Sibanda (2007a) did not investigate their special cause variation, but they advised that examination should start with checking the accuracy of data before considering other factors. Twijnstra et al. (2014) suggested a checklist that could be used to investigate special cause variation. Their checklist had five factors: patient, surgeon, team, equipment, and logistic. However, the checklist was neither tested nor validated. Additionally, the checklist provided no weight for each factor and gave no particular ordering for initiating an investigation.

Views and feedback about the use of SPC charts (Appendix 9)

Appendix 9 summarises the views and feedback about applying control charts as reported in the studies included in the review. All studies that commented on their experience of applying control charts had a positive view about its usefulness and feasibility. Two important features of SPC chart were valued most by authors. First, its ability to simplify and visually represent repeated measurements of a specific process. Second, its ability to early detect any deviation/error that could have been missed when other statistical tools are used.

Authors have also raised a number of practical limitations when applying control charts. For example, Baghurst (2013) emphasised that the effectiveness of control charts depends on the accuracy of the data being used, which is not always easy to ascertain. Additionally, authors have realised that detecting the existence of an abnormality does not provide a signal to the cause (Chang et al. 1979; Sibanda and Sibanda 2007a; Groome et al. 2009). These two limitations, however, are not specific to control charts and can be seen with other statistical tools. A more specific limitation related to control charts was the difficulty in correctly setting the control limits for CUSUM charts (Lane et al. 2007; Sibanda and Sibanda 2007a; Papanna et al. 2011; Baghurst 2013; Peeters et al. 2014; Twijnstra et al. 2014). This difficulty in setting the control limits for CUSUM charts was explained to be due to the absence of universally accepted standards and the challenges involved in the risk-adjustment models which are pre-requisite for the successful application.

5.5. Discussion

The findings of this review support the existing evidence about the increasing application of control charts in healthcare. It has specifically demonstrated that control charts have been widely used in maternity units using different types of charts in different countries.

The fact that 46 variables were monitored using control charts across different quality dimensions shows that its application can be expanded to include other variables across maternity care services. Another important finding was the use of control charts to both monitor and improve the current performance. Their ability to show sustained improvement make control charts more useful compared to other monitoring tools, such as clinical auditing, and league tables.

The selection of the variables to measure the quality of care in maternity units is an essential step that needs to be addressed before starting data collection and data analysis (Boulkedid et al. 2013). Failing to select the relevant variables means that organisations may spend time and effort measuring variables that are not appreciated by the stakeholders. The included studies, except one, provided no methodology or approach for how their variables were selected. Nevertheless, all studies have provided evidence supporting the importance of the variables that were selected. The study by Boulkedid et al. (2013) provided an example of how consensus could be reached through the Delphi technique to select the most relevant technique. It might be useful if such a method is considered before selecting the variables to be monitored.

This review attempted to assess the adherence of the included studies to Koetsier's tool, which was the only tool that was available for use. As this review did not aim to search for methodological criteria/tool, it is possible that other tools also exist. It can be concluded, however, that no standardised tool was used for constructing control charts in the included studies. Our attempt was faced with two main challenges. Firstly, the non-applicability of the tool to some types of charts made it difficult to include all the studies. Secondly, one out of the four criteria of the tools, adherence to the use of non-skewed data, was not applicable because none of the included studies reported information about

the skewness of data. Thus, only studies that used Shewhart control charts were assessed for adherence to the remaining three criteria.

The findings, however, were different from the findings by Koetsier et al. (2012). For example, in their review, almost all studies (98.2%) (55 out of 56) adhered to the use of 3 SD, compared to 44% (4 out of 9) in our review. Additionally, they found that adherence to the use of 10-35 data points was around 50%, compared to 89% in the current review. A possible explanation could be the small number of studies that were examined for adherence in this review compared to their study. Another possible explanation could be that in this review, studies have not reported (44%) the SD that was used to construct the control limits. Although few studies reported that their control charts were constructed according to a particular reference, no attempt was made to trace the recommendations. Thus, it is possible that they have used the 3 SDs but were labelled in this review as not-reported. Setting control limits, especially for CUSUM charts, is not a straightforward task. This challenge is in line with the findings reported by Biau et al. (2007) who confirmed that CUSUM charts were mislabelled and limits were misused.

Similar to what was found by Koetsier, non-reporting of the methodological criteria for constructing control charts is not uncommon. Therefore, in addition to the need for a comprehensive (applicable to different types of control charts) standardised tool to construct control charts, there is a need for a tool to systematically report the methodology used to develop the control charts. These two tools will make it easier to comment on the strength of any study using control charts.

The review has shown that when attempts were made to analyse the special cause variation, no standardised tool was used. Instead, possible causes were only suggested. The only checklist that was suggested by Twijnstra et al. (2014) was neither tested nor

validated. Having a validated tool to investigate special cause variation is very crucial because designing an intervention would require removing or minimising the factor causing the special cause variation.

Mohammed et al. (2005) developed and tested a model that was used to investigate special cause variation (see Figure 5.3). Although the tool was tested to monitor the general practice mortality, there is no reason to say that it cannot be used in other settings. The model was represented in a pyramid that consisted of five layers suggesting that the lower layer (data) is responsible for most of the special variation while the higher layer (carer(s)) could be a reason in fewer cases. They suggested that the investigation should start with checking data and then going up the pyramid. However, this pyramid has not been further tested in other settings. Therefore, further tests might be needed before making definitive conclusions on the applicability of the tool.

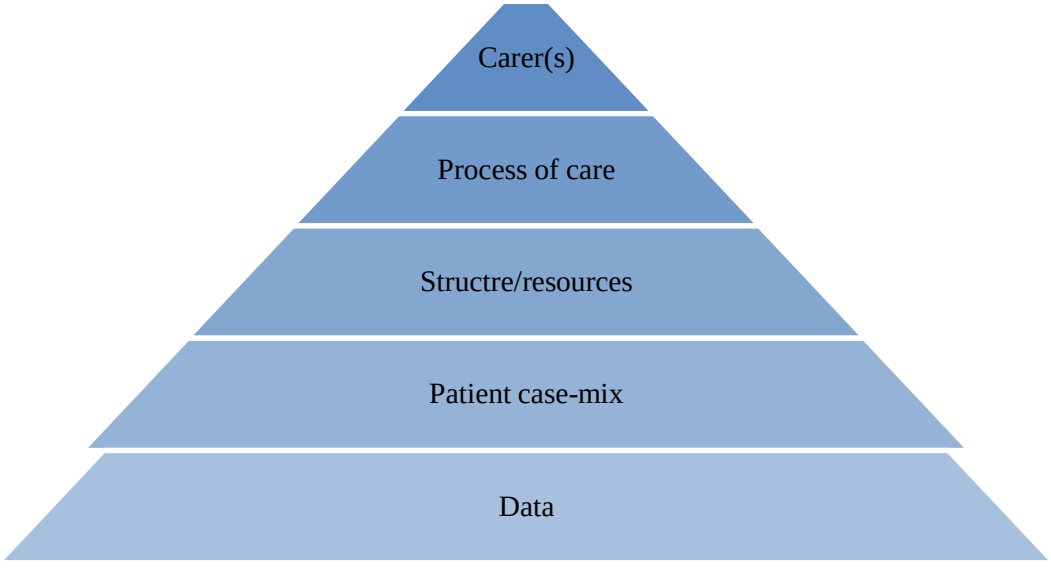

Figure 5.3: A pyramid model to investigate special cause variation Adapted from (Mohammed et al. 2005)

5.5.1. Limitations of this review

There are a number of limitations inherent in this review. The search, scan and synthesis of the results were conducted mainly by a single reviewer. To reduce selection bias a

second reviewer was frequently consulted when the primary reviewer was not able to make a clear decision on the eligibility of the paper for inclusion, and when the type of control chart was not clear. Grey literature was not searched. This might lead to selection bias. However, the number and the range of databases used for this review make it likely that the most important relevant articles were included in the review. Additionally, reviewing the reference lists of the included papers for relevant papers makes this review more comprehensive.

5.6. Conclusions

Monitoring the quality of care in maternity units is an essential step for any future improvement initiatives. It was shown that SPC with its diagrammatic representation, i.e. control chart, is both useful and feasible for monitoring and improvement purposes. However, the challenges associated with the use of SPC need to be addressed before making firm conclusion. Different types of control charts were used to monitor a wide range of process and outcome variables in different countries and different settings. Considering the challenges raised by the included studies and the gaps found by the review authors, the following recommendations are made to further expand the usefulness of control charts. First, the selection of indicators needs to be based on a strong methodology to ensure maximum participation and relevance to the institution. Second, a criteria-based tool needs to be developed to ensure consistency for reporting the methodology used to construct the different types of control charts. Koetsier's tools might be considered as the base for such a tool with an aim to make it as comprehensive and as applicable as possible. Third, a standardised tool needs to be developed for investigating special cause variation. The pyramid developed by Mohammed and colleagues could be considered for further tests before its wider application.

6. Chapter six Research paradigm and underpinning theory

6.1. Introduction

This chapter outlines the research methodology using Saunders Research Onion which include different layer of research methodology (research philosophy, research approach, research strategy, time horizon and data collection methods) (Saunders et al. 2007). It then discusses the ethics and confidentiality considered to conduct this project. The following sections will briefly describe the methodology for conducting the three studies that will achieve the aim and objectives of the thesis. A detailed description of the methods and the tools used for data collection will be provided separately for each study in following relevant study chapters. The chapter ends with a description of the pilot phase that was conducted in Oman.

6.2. Research philosophy and research approach

Being aware of the philosophical assumptions is an important step in the process of conducting any research. Creswell (2013) listed a number of reasons that explain the importance of not only becoming aware of these assumptions but also to explicitly present them to readers. Firstly, the research assumptions inform the development of research questions and how they are answered. Secondly, these assumptions are influenced by the background and working environment. Thirdly, they help resolve unnecessary conflicts and debates between the author and readers/reviewers. When researchers declare their research paradigm, they are in fact outlining the assumptions they have about the nature of reality (ontology) and how that reality can be known (epistemology) (Harrits 2011). In social science, there are two main types of ontological assumptions namely positivist and interpretivist (also called constructivists). Constructivists believe that there is no single

reality but multiple realities that are constructed and generalizations of data are not possible and not even desired. They also believe that realities cannot be separated from the researcher (knower) (Johnson and Onwuegbuzie 2004). The main limitation and critics of constructivism is its approach to understand a phenomena as perceived by individuals who might be totally different from each other and thus reaching to non-reliable conclusions (Creswell et al. 2011).

Positivist, on the other hand, believe that: (a) there is a single tangible reality, (b) causation can be explained by real causes, and (c) research must be conducted in a controlled environment where scientific tools are used to gather information in a random sample and analysis should be done statistically (Rodwell 1990). However, the strict adherence to quantitative methods by positivist is criticised for not recognizing the complexity of human behaviour (Hasan 2014). Qualitative research is in line with interpretivist's assumption while quantitative research is more in line with positivist's assumptions (Johnson and Onwuegbuzie 2004).

Pragmatism is another ontological stance that integrates both perspectives, qualitative and quantitative approaches. Pragmatism commonly supports mixed method approach (Johnson et al. 2007). One of the main strengths of pragmatism is that it does not restrict itself into one reality and researchers have more freedom to choose from the available techniques and methods. Additionally, pragmatists believe that reality is what works on that particular time and context (Creswell 2013). These assumptions make pragmatism more practical and useful to researchers for day to day practice in an environment that is constantly changing.

In this thesis, the researcher is taking a pragmatists stance for conducting this research. There are two main reasons that can explain this ontological stand. The first reason for

taking the pragmatist stance is the constructs being measured in this research. In this thesis, the main constructs being measure are: safety culture, satisfaction, and caesarean section rate. Although these constructs are being measured quantitatively, they are qualitative in nature (particularly safety culture and satisfaction). Thus, using a simple positivists approach does not match the multidimensionality and qualitative nature of culture and satisfaction. Similarly, attaining a generalized and practical understanding of the organizational performance cannot be achieved by using a constructivist approach. Additionally, applying a number of monitoring tools to healthcare organisations implies that the researcher is assuming that each institution is performing differently and we need to investigate the reasons for these variations. Documenting these variations need to be based on an objective measurement so that results are practically interpreted to allow improvement actions. Achieving such objectives need to be based on a pragmatist assumptions about reality.

The other reason for taking the pragmatist stance is related to the background and the position of the researcher in the MoH of Oman. The researcher was trained to be a medical doctor. In the medical field, decisions need to be based on evidence and measurable facts. For example, management of diabetes should be based on facts that we should be looking for. To diagnose a person as being diabetic, blood tests like blood sugar level are used to confirm his/her status otherwise, patients can't be labelled as a diabetic. Similarly, treatment and follow-up would be based on the response of their bodies to the different treatment options. The researcher is holding a position of a director of monitoring and evaluation department in the MoH-Oman. This position requires practical understanding of reality and decisions to be made about the performance of each institution/department at that particular time. Such decisions must be based on facts that

are objectively measured. Without these objectively measured facts about performance (reality), one can't judge the quality of care in each organisation.

6.3. Research strategies, time horizons and data collection methods

The research strategy and the research methods were informed by the pragmatist ontological stance of the researcher. Qualitative studies help understanding complex social issues like patient safety culture and patient satisfaction. This type of research provide un in-depth information about the concept being measured and answer questions that can't be answered by quantitative studies like 'what', 'how' and 'why' (McCusker and Gunaydin 2015). Although qualitative studies can produce a deeper understanding of a subject, findings can't be generalised to the larger population (Pöchhacker 2006). Generalisation is very important in this study so that the different monitoring tools can be applied to other departments outside maternity units and thus, the three different measurement approaches were conducted quantitatively. Additionally, quantitative studies are more useful than qualitative methods in terms of replication and objectivity because the researcher almost has no direct relationship with the respondents (Haq 2015). To gain the advantages of both methods, many researchers call for mixed methods research. Including qualitative methods to this research was considered at some points during the research journey. However, due to the already high load of the current research where different literature reviews and different field studies aiming to cover all the maternity units in Oman and considering the available time and resources, it was decided that adding a qualitative method would not be feasible in this research. However, it is important that qualitative research need to be considered at a later stage to attain deeper understanding and answer questions that may rise from the quantitative studies.

The research aim and objectives were outlined in the introduction chapter (see section 1.3 page 15). The methods used to achieve these objectives are described in detail in the relevant study chapters (i.e. chapter 7, 8, 9, 10, and 11). To avoid repetition, the methodology is not discussed in this chapter. Table 6.1 summarizes the methods used to achieve the study aim and objectives. It can be seen that the first four studies use survey strategy in 10 maternity units in a cross-sectional time horizon. The SAQ will be distributed to maternity staff for three weeks in study one and study two while in study three and four a newly developed and validated questionnaire (the CCSS) will be distributed to mother given birth in maternity for a duration of four weeks. The fifth study also uses survey strategy but in a longitudinal time horizon where data will be collected from secondary data readily available from MoH, Oman web site.

Table 6.1: Summary of methods used to achieve the study aim/objectives

Study aim	To measure the quality and safety of maternity units in Oman using three approaches.		
Study objectives	**Chapter 7**	1. To measure patient safety culture level	For a duration of three weeks, an existing valid survey was distributed to all staff (nurses, physicians and students) working in all the ten maternity units in governorate hospital in Oman
	Chapter 8	2. To examine the association between nurse's nationality and patient safety culture	
	Chapter 9	3. To validate an Arabic language survey to measure maternal satisfaction about the childbearing experience.	A new Arabic survey was developed by merging two valid English surveys.
	Chapter 10	4. To measure patient satisfaction about the childbearing experience	For a duration of four weeks, the new survey was distributed to all mothers who delivered a baby during the study period in the ten governorate hospitals.
	Chapter 11	5. To use statistical process control charts for examining caesarean section rates across maternity units.	The Annual Health Report produced by the Ministry of Health (available online) was used to gather information about the caesarean section rates. Run and control chart were constructed to understand these rates.

6.4. Ethics, confidentiality, and anonymity

The researcher obtained the ethical approval for conducting the whole research for the different studies. This thesis was approved by both the University of Bradford (Appendix 10) and the Ministry of Health in Oman (Appendix 11). Hospitals were approached through the Directorate General of Quality Assurance Centre where a letter was sent to clarify that a UK-based PhD student is planning to conduct a study in their hospitals. In that letter executive directors were requested to liaise with the maternity department in their hospital to decide whether they would like to participate in this study. In the same letter a brief description was made about the study objectives and the study participants. In addition, they were insured that the name of the hospital will be anonymous to ensure confidentiality. Where human participants were involved, an information sheet was provided in front of the questionnaire to explain the purpose and importance of the study (Appendix 12) and Appendix 13). The information sheet also emphasizes that participation is voluntary and will not negatively affect them in any way in the future. To ensure confidentiality and anonymity, participants were not asked to provide any information that can identify them like name, identification number, address or mobile number.

6.5. Context of the study

The whole project was conducted in maternity units of the Governorate hospitals that are under the umbrella of MoH-Oman. As described in the introduction chapter, Oman is administratively divided into 11 Governorates (counties). In each Governorate, there is one governorate hospital providing secondary care services to people living in that governorate except for Muscat Governorate (the Capital) where hospitals provide tertiary care levels for people from all Governorates. To ensure homogeneity of hospitals, the

research included governorate hospitals providing secondary care services and excluded hospital in Muscat Governorate. Thus, ten secondary care hospitals (governorate hospitals) are included in this research. Table 6.2 provides some statistics related to these ten hospitals. Throughout this research, these hospitals were termed H1-H10 to maintain confidentiality. The number of beds varied across the hospitals from 510 beds in H8 to 40 beds in H2. The number of maternity beds available for each hospital ranged from 86 bed in H8 to six beds in H2. The maternity beds occupancy rate in H3 reached 96% while in H2 was only 8%. The number of visits to maternity clinics was highest in H6 (14815) and lowest in H2 (232) (MoH 2017).

Table 6.2: Maternity related statistics by governorate hospital

	H1	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**
Number of all beds	150	40	191	240	102	305	236	510	375	229
Maternity beds (Gynaecology and Obstetrics)	29	6	28	52	12	60	51	86	72	57
Maternity Bed Occupancy rate (%)	58	8	96	75	36	81	91	68	94	53
Maternity bed length of stay (day)	2	1.5	1.8	2.1	1.7	1.4	1.7	1.6	2.1	2.1
Maternity clinic visits	5374	232	8468	11054	NA	14815	1793	6085	9793	9650

NA: *Not available*

6.6. Pilot study

As this thesis was implemented in 10 Governorate hospitals, it was thought that piloting the research methods in one hospital will help in identifying any challenges that might face the study. This section will briefly discuss the process of the piloting phase and the lessons learned from it. Data collected from the pilot phase is included in the thesis. It should be emphasized that the same tools, procedures, and methods were used in all the participating hospitals. Thus, results of the pilot phase will not be discussed separately but rather as part of the overall analysis for each study. However, the reason for describing the pilot phase is to document the process that led to the successful execution of the study so that future national studies might learn from.

The pilot phase started in January 2017 and ended by April 2017. The pilot site, Sohar hospital, was purposely selected for two main reasons. First, it is the second largest hospital in terms of bed number. Thus, it was expected that most of the challenges will be identified as it will be a good representation of the remaining hospital. Second, the executive director and quality department staff were very excited and cooperative to participate in the study. Although that level of cooperation was not expected from all other hospitals, their cooperation was very useful and helped gaining the commitment of other hospitals. The smoothness of the pilot phase was used as a success story that was used to inspire the remaining hospitals.

The piloting was initiated by explaining to the head of quality department the different studies and the required support to complete the study. The head of quality department discussed the project with the executive director, head of nursing section and head of maternity department who showed a very positive commitment. Then, a guideline describing the aim, objectives, tools, and the process of distribution and collection was developed in cooperation with the head of quality department. Once the plan was clear and ready, the survey tools used for the thesis were sent by email to the head of quality department. They were requested to document any challenge they face during survey distribution or collection.

The details of executing each study will be described in the relevant chapter as almost the same process was carried out in the remaining hospitals. However, a number of learning lessons were taken from the pilot phase and are worth mentioning. First, the early involvement of the executive director, the head of nursing section and the head of maternity department, has helped in the smoothness of the study. Second, making a list of names for doctors and nurses helped organizing the distribution plan. Third, the morning

meeting was the best time to distribute the surveys to doctors. Fourth, agreeing with head of maternity the best day of the week for survey distribution was very useful. Fifth, appointing the shift in-charge to be responsible for distributing the surveys to women has helped in improving the participation rate in the women's satisfaction study.

After the piloting phase, official letters were sent from the Directorate General of Quality Assurance Centre to the 10 targeted Governorate hospitals to invite them to participate in the study. All the 10 Hospitals accepted the participation and were requested to send the head of quality department to attend a meeting to explain the thesis project. During the meeting, the head of quality department from the pilot phase explained the process and highlighted the factors that helped in the success of the project. Then, printed copies of the surveys along with the survey distribution/collections guidelines were given to heads of quality department. Hospitals started the study at different timings (one or two weeks difference) but the whole study took around three months.

Thesis road map

Figure 6.1 shows the main steps taken from starting the PhD till the write up phase.

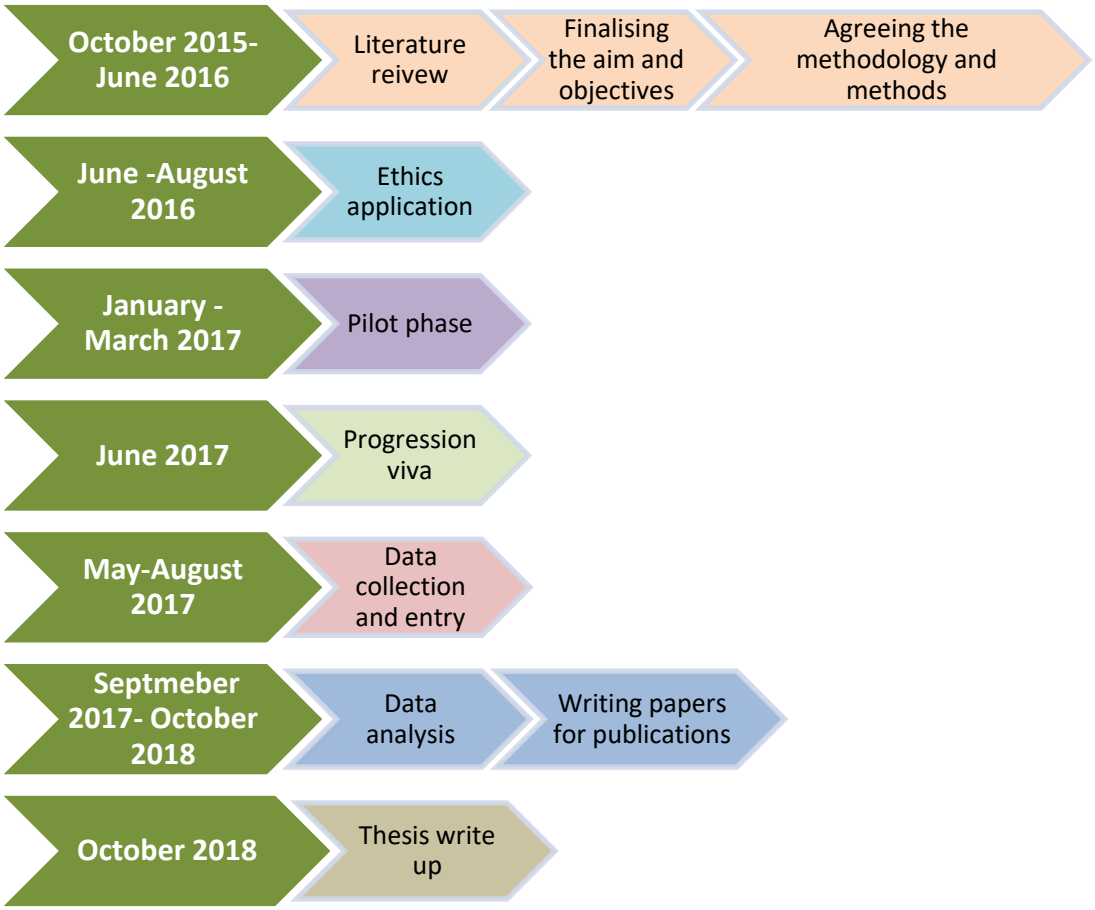

Figure 6.1: Thesis road map

6.7. Chapter summary

This chapter described the philosophical assumptions of the researcher, and the methods used to achieve the study objectives were briefly outlined. In summary, a pragmatist stance is taken in this research with an aim to measure the quality and safety in ten maternity units using three different monitoring approaches. The five specific objectives of the thesis will be achieved through collecting data using different sources. The details of the data sources and the data collection will be discussed in the following study chapters where each chapter will represent one of the research objectives.

Chapter 7

Patient safety culture in maternity units in Oman

The material presented in this chapter is accepted and published as:

Al Nadabi, W., Faisal, M., Mohammed A.M. (2019) ‘Patient safety culture in maternity units in Oman’. Journal of evaluation in clinical practice

7. Chapter seven: Patient safety culture in maternity units in Oman

7.1. Abstract

A positive patient safety culture in maternity units has been linked to better safety outcomes. However, safety culture varies across organisations. Understanding these variations helps organisations to learn from each other's performance. This chapter presents the study conducted to examine safety culture in ten maternity units in Oman using control charts. The Safety Attitude Questionnaire (SAQ) was distributed to all healthcare professionals working in ten maternity care units in Oman's hospitals. Of the 892 members targeted, 735 (82%) questionnaires were returned. Job satisfaction had the highest safety score (4.10) while stress recognition was the lowest (3.17). Safety scores were higher among those who have 10 to 20 years of experience but no difference was found between nurses and physicians. The overall percentage of positive safety responses in all hospitals ranged from 53% to 66% but no hospital reached the targeted response of greater than 70%. Control charts showed that the overall percentage of positive responses exhibited special cause variation where three hospitals (H1, H7 and H10) were above the control limits while one hospital (H4) was below the limits. One hospital (H1) was above the limits in all dimensions except stress recognition. In conclusion, the safety culture in maternity units is below the target in all hospitals. Control charts proved to be useful in visually detecting and determining the variation type in safety dimensions across hospitals. Future improvement studies should focus on hospitals performing below the limit to identify/remove the factors causing special cause variation possibly by learning from hospitals above the limits.

7.2. Introduction

Improving maternity services is a matter of global concern (UN 2015). Developing patient safety culture should be the heart of all initiatives aiming to improve the quality and safety of health services (Weaver et al. 2013b). A positive safety culture was found to be significantly linked with reduced mortality; increased family and patient satisfaction; reduced readmission rates; decreased community acquired pneumonia rate; and decreased hospital acquired pressure ulcers (DiCuccio 2015).

In the Sultanate of Oman, where the current study was conducted, there were two previously published studies that assessed the safety climate. The first study was by Al-Mandhari et al. (2014) who examined safety climate among staff (including physicians, nurses, pharmacists, and others) in six different hospitals using the Hospital Survey on Patient Safety Culture. Using the same tool, Ammouri et al. (2015) examined the safety climate among nurses in four hospitals. However, both studies examined patient safety culture at hospital level and results at department level were not discussed.

Hospitals and departments have varying perceptions of safety culture (Deilkås and Hofoss 2010). Understanding variation between these departments will not only help in prioritising the hospitals/department that most need intervention but will also lay the foundation for learning from each other (Edmondson 2004). That is to say, hospitals with the lowest level of perception of safety culture can learn from those with highest perception levels. However, understanding this variation is not a simple task.

As discussed in chapter 5, Shewhart's theory, or Statistical Process Control (SPC), provides an approach to differentiate between two main types of variation: common cause and special cause variation. According to SPC, every process will produce different results if measured repeatedly under stable conditions. As the term implies, common

cause variation is due to chance while special cause variation is due to special factors affecting the process. Determining the variation type guides the process owner to the required action. Special cause variation requires process redesign to reduce the variation while the special cause variation requires identifying and removing the cause to bring the process into control (Mohammed et al. 2001).

A control chart is the graphical representation of the SPC. Generally, the chart will have three horizontal lines: a central line (the mean), an Upper Control Limit (UCL), and a Lower Control Limit (LCL). If the measurement follows a special pattern or if the measurement falls outside the control limits, then the process is called 'out of control' exhibiting a special cause variation. On the other hand, if all the measurement lie within the control limits, then the process is termed to be within control representing special cause variation (Mohammed et al. 2001).

Control charts were first introduced in the manufacturing industries and, when applied in health care settings, were found to help decision makers to manage and improve the quality across different specialities and several health indicators (Thor et al. 2007). Tennant et al. (2007) reviewed the use of control charts to monitor patients. They found that control charts were used to monitor four clinical conditions including hypertension, asthma, renal function post-transplant, and diabetes. Most importantly, they found that using control charts were more sensitive and specific in detecting improvements/deterioration in clinical conditions compared with other existing clinical method. Also, they found that monitoring clinical conditions using control chart was linked with better experience for the patient and the carer.

In relation to safety culture, Robinson (2014) examined the use of control charts to understand specifically the adverse-event reporting culture which is one component of

patient safety culture. The author concluded that using control charts helped in transforming data into useful information and provided quicker feedback about the effectiveness of interventions on safety culture. Despite the increasing use of these charts, their application in understanding variation of safety culture across different organisations is still relatively uncommon and further research is needed to maximise their effective use (Tennant et al. 2007).

7.3. Objectives

The specific objectives of this study are:

- To establish a baseline level of safety culture in maternity units in Oman
- To test the association of patient safety culture level with job role, years of experience and nationality of maternity staff.
- To understand the variation of safety culture in the maternity units using control charts.

7.4. Methods

7.4.1. Research strategy

This is a quantitative cross-sectional study.

7.4.2. Data collection tool

The English short form of the Safety Attitude Questionnaire (SAQ) was used to examine PSC in this study (available at https://med.uth.edu/chqs/surveys/safety-attitudes-and-safety-climate-questionnaire/). The SAQ was developed by the University of Texas and has a total of 36 questions covering six domains. The six domains are: teamwork climate (items 1-6), safety climate (items 7-13), job satisfaction (items 15-19), stress recognition (items 20-23), perception of management (items 24-28), and working conditions (29-32).

All the 36 questions use a five-point Likert scales as follows: disagree strongly =1; disagree slightly =2; neutral =3; agree slightly =4 and agree strongly =5, but items 2, 11, and 36 are reverse coded (Sexton et al. 2006) and this was taken into consideration when presenting the results. In the original questionnaire, items 24-28 were asking participants about their perception about management at two levels, the hospital and department level. As this study focused on maternity units, participants were asked to rate their perceptions about management at their department level only.

The SAQ was selected for three reasons. First, as it was shown in the systematic review in chapter two, SAQ was the most commonly used tool to assess PSC in maternity units in different countries. Second, the psychometric testing of this tool has been evaluated in different countries including USA, UK and Norway and its validity and reliability have been established (Sexton et al. 2006; Deilkås and Hofoss 2008; Bondevik et al. 2014). Third, the SAQ is a one-page tool, relatively short and easy to fill. The Cronbach's alpha of the original scale was found to be 0.93 (Raftopoulos et al. 2011), and in this study 0.91. The final SAQ that was distributed to participants is attached (Appendix 14).

7.4.3. The language of the data collection tool

Although the study was conducted in an Arabic-speaking country, the language of the tool was in English because all the clinical staff are fluent in English as it is the commonly used language for communication within Ministry of Health (MoH) institutions.

7.4.4. Sampling and sample size

As discussed above, this entire research was undertaken in maternity units of the ten MoH Governorate hospitals of Oman. The patient safety culture study included all doctors (including interns), nurses (including interns), students, and midwives working in maternity units. As outlined in the guidelines for using the SAQ, staff members who have

been working in the department for less than 4 weeks were excluded from the study. Best efforts were made to trace staff members who were on their annual/maternity leave. If they returned to work from their leaves during the c study period, they were asked to participate. Otherwise, they were excluded. A detailed description of the number of staff members by category that were targeted for this study can be found in Appendix 15. The study excluded staff groups that are not based in maternity but provide services for staff/patient in maternity units like pharmacist, physiotherapists and medical orderlies (porters). To avoid any possible bias and in line with the guidelines (Sexton 2003), no incentives were given to individuals participating in this study.

7.4.5. Distribution of the survey

The survey was first piloted in January 2017 in one hospital for three weeks before conducting it in the remaining hospitals during the period from April –May 2017. Data from the pilot site is included in the study. Staff members working in the quality departments (of the ten hospitals) with the support from the national quality assurance centre were asked to distribute the questionnaire. A meeting was held to brief them the aim, objectives and the methodology of the study. They were introduced to the questionnaire itself and the process of distributing and collecting the questionnaire. A detailed written plan of the distribution, in the form of questions and answers, was provided to ensure consistency in distributing and collecting the questionnaire from the different hospitals (Appendix 16). As detailed in the plan, participants were handed the questionnaire with a self-adhesive envelope and a pen. They were requested to put the completed questionnaire inside the envelope. The use of envelopes will assure participants about the confidentiality of their responses (McColl et al. 2002).

As it was found that response rate with an electronic version was poor (Sexton 2003), this option was not considered as a method for distribution in this study. To further maximise the response rate, staff in the quality departments were requested to agree on the date and timing of distribution with the executive director of the hospital, the head of the nursing department, and the head of the maternity department.

As suggested by the guidelines developed for the use of SAQ, the number of copies given to each hospital was based on the total estimated number of staff working in the department with extra copies for any lost or misplaced questionnaires (Sexton 2003). Because the SAQ was distributed to different hospitals, a unique code for each hospital was given to every questionnaire. Additionally, questionnaires for each staff category (doctor, nurses, midwives) in different areas of the maternity departments were given a unique code (Appendix 17). All questionnaires were sequentially numbered and preceded by its code. For example, questionnaires distributed for 30 doctors in Sohar Hospital were coded from SOHD1 to SOHD30. This is in line with what has been suggested by Sexton (2003) and helped in organising the data entry process. Furthermore, questionnaires were printed in colour to ensure maximum response rates (Sexton 2003).

The in-charge nurse collected surveys from nurses while the quality department staff collected the physician's surveys. Once collected, quality departments sent all surveys to a central department in the MoH where data was entered.

7.4.6. Data entry

Data was entered in a prepared Microsoft Excel sheet by a coordinator working for the researcher. The coordinator was trained on how to perform the data entry. The researcher double checked data entry by taking a random sample of 10 surveys which were traced for accuracy.

7.4.7. Reminders and duration of the study

It is expected that not all participants will submit their questionnaires at the same time. Reminding participants of the need to submit their questionnaire increases the response rate (McColl et al. 2002). Therefore, participants were reminded by the heads of the quality departments twice with a week gap between the reminders. The study was conducted for three weeks after which the study was considered complete.

7.4.8. Data analysis

The survey's Likert scales were used to measure the mean score for each of the 36 safety items. Items number 2, 11, and 36 in the survey were appropriately reversely coded as per the guidelines. The overall mean scores were calculated by summing up the score (from 1-5) from all respondents and dividing by the number of responses. Similarly, the mean score for each safety domain was calculated by adding the scores of items for each domain and dividing by the number of responses. To calculate the percentage of positive responses, these responses were regrouped into negative response (disagree strongly, disagree slightly), positive response (agree strongly, agree slightly) and neutral response (Sexton et al. 2006).

Descriptive statistics for the responses were used to summarise, analyse, and present the findings (Fisher and Marshall 2009). One way Analysis of Variance (ANOVA) test and two sample independent t-tests were used to compare the mean safety scores for the different categories. When ANOVA was significant, the Bonferroni post hoc criterion was used to identify the groups with significant differences in means. Chi-square test was used to test for association between variables. Statistical significance was set at $p<0.05$ (Gray 2006). When variables were not reported (missing), data were considered as a separate

category in the analysis. All data cleaning and analysis were conducted using StataCorp (2015).

Proportional (P) control charts were developed to understand the variation across hospitals. The average percentage of positive response (agree strongly, agree slightly) for each safety domain was the central line of the chart. The selection of the type of control chart and the equations used to plot the control charts followed the guidelines by Provost and Murray (2011) as follows:

First: selection of SPC chart type

The data to be plotted was the percentage of positive responses. According to the science of improvement, this type of data is considered as an attribute classification data because data is classified into confirming (positive responses) and nonconforming (negative responses). Since the data used was in percentage of conforming, and based on Provost's selection guide (see Figure 5.1), Proportional chart (P-Chart) was considered as the most appropriate type.

Second: constructing control charts

P-Control charts were constructed for each of the six safety domains. As detailed above, constructing control charts involved three lines. The lines were constructed using the following equations as recommended by Provost for P charts with varying subgroup sizes.

- Central Line (CL) = mean = $\bar{P} = \frac{\sum p_i}{\sum n_i}$
- Standard Deviation = SD = $\sqrt{\left(\frac{\overline{P}(1-\overline{P})}{n_i}\right)}$
- Upper Control Limit = UCL = $\overline{P} + 3 * SD$
- Lower Control Limit = LCL = $\overline{P} - 3 * SD$

Where p_i = the number of positive responses for each hospital for a particular safety domains, n_i = the number of all responses for each hospital for that particular safety domain.

7.4.9. Sample and settings

The study was conducted in all maternity units of the 10 secondary care hospitals that are under the umbrella of the Ministry of Health in Oman (MoH 2015a). A detailed description of the participating hospitals is included in chapter 6 under (see page 98).

7.4.10. Ethics, confidentiality, and anonymity

This research was approved by both the University of Bradford (Appendix 10) and the Ministry of Health in Oman (Appendix 11). An information sheet was provided at the front of the questionnaire to explain the purpose and importance of the study (Appendix 12). The information sheet emphasizes that participation is voluntary and will not negatively affect them in any way in the future. Agreeing to complete the questionnaire was considered as consent to participate in the study. To ensure confidentiality and anonymity, participants were not asked to provide any information that could identify them such as name, identification number, address or mobile number.

7.5. Results

7.5.1. Survey responses and respondent's characteristics

Out of 892 targeted population, 735 questionnaires were returned from the 10 hospitals yielding an overall response rate of 82% (See Table 7.1). The response rate per hospital ranged from as low as 58.0% (H3) to as high as 96.7% (H5). Maternity services in the participating hospitals are almost always provided by female staff, and thus 100% of the population is female. The characteristics of participants in each hospital are presented in

Table 7.2. Overall, the majority of participants were non-Omani (36.7%), nurses (73.6%), having 5-10 years' experience in speciality (32.4%).

Table 7.1: Response rate

	H1	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**	**Total**
Targeted population	57	20	69	104	30	101	111	141	180	79	892
Completed questionnaires	51	17	40	86	29	94	102	106	147	63	735
Response rate (%)	89.5	85.0	**58.0***	82.7	**96.7****	93.1	91.9	75.2	81.7	79.7	82.4

:** lowest value, *:** highest value

Table 7.2: Respondent's characteristics

	H1 N (%)	H2 N (%)	H3 N (%)	H4 N (%)	H5 N (%)	H6 N (%)	H7 N (%)	H8 N (%)	H9 N (%)	H10 N (%)	All N (%)	Chi square test	P value
N (%)	**51**	**17**	**40**	**86**	**29**	**94**	**102**	**106**	**147**	**63**	**735**		
Nationality													
Omani	15 (29.4)	0 (0.0)	14 (35.0)	26 (30.2)	2 (6.9)	19 (20.2)	16 (15.7)	10 (9.4)	25 (17.0)	17 (27.0)	144 (19.6)	87.5143	<0.001
Non-Omani	21 (41.2)	15 (88.2)	8 (20.0)	14 (16.3)	14 (48.3)	29 (30.9)	25 (24.5)	59 (55.7)	62 (42.2)	23 (36.5)	270 (36.7)*		
Missing	15 (29.4)	2 (11.8)	18 (45.0)	46 (53.5)	13 (44.8)	46 (48.9)	61 (59.8)	37 (34.9)	60 (40.8)	23 (36.5)	321 (43.7)		
Position													
Nurse	35 (68.6)	15 (88.2)	25 (62.5)	62 (72.1)	18 (62.1)	64 (68.1)	78 (76.5)	74 (69.8)	118 (80.3)	52 (82.5)	541 (73.6)*	73.5528	<0.001
Physician	16 (31.4)	2 (11.8)	4 (10.0)	16 (18.6)	9 (31.0)	17 (18.1)	20 (19.6)	26 (24.5)	21 (14.3)	8 (12.7)	139 (18.9)		
Other	0 (0.0)	0 (0.0)	5 (12.5)	0 (0.0)	1 (3.5)	4 (4.3)	0 (0.0)	0 (0.0)	2 (1.4)	0 (0.0)	12 (1.6)		
Missing	0 (0.0)	0 (0.0)	6 (15.0)	8 (9.3)	1 (3.5)	9 (9.6)	4 (3.9)	6 (5.7)	6 (4.1)	3 (4.8)	43 (5.9)		
Year of experience													
<5 years	10 (19.6)	6 (35.3)	18 (45.0)	23 (26.7)	6 (20.7)	23 (24.5)	42 (41.2)	35 (33.0)	29 (19.7)	17 (27.0)	209 (28.4)	89.3228	<0.001
5 to 10 years	9 (17.7)	9 (52.9)	8 (20.0)	31 (36.1)	11 (37.9)	38 (40.4)	32 (31.4)	26 (24.5)	56 (38.1)	18 (28.6)	238 (32.4)*		
11 to 20 years	25 (49.0)	2 (11.8)	8 (20.0)	23 (26.7)	9 (31.0)	13 (13.8)	18 (17.7)	31 (29.3)	45 (30.6)	14 (22.2)	188 (25.6)		
21 or more	7 (13.7)	0 (0.0)	3 (7.5)	2 (2.3)	3 (10.3)	6 (6.4)	5 (4.9)	10 (9.4)	10 (6.8)	10 (15.9)	56 (7.6)		
Missing	0 (0.0)	0 (0.0)	3 (7.5)	7 (8.1)	0 (0.0)	14 (14.9)	5 (4.9)	4 (3.8)	7 (4.8)	4 (6.4)	44 (6.0)		

***:** Highest percentages in the category

7.5.2. Safety score across hospitals

Table 7.3 shows the safety scores in the ten participating hospitals by safety domain. It can be seen that safety scores varied across hospitals. The overall mean safety score for all hospitals was 3.68 ranging from 3.57 (H4) to 3.84 (H10) and no hospital had a score above 4.0. Job satisfaction had the highest score (4.10) while stress recognition had the lowest score (3.17). The job satisfaction domain has five items (15-19) in the safety attitude questionnaire and all items were highly scored (above 4.0). Among the five items, item number 15 'I like my job' had the highest safety score (4.3). The stress recognition has four items (20-23) and all items were scored below 4.0. Compared with other items in this domain, item number 23 '*Fatigue impairs my performance during emergency situations'* received the lowest score (see Appendix 18 for all item safety score).

Table 7.3: Safety score by nationality, job role, years of experience, and safety domain

Hospital	**H1**	**H2**	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**	**Total**
	M (SD)	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**	**M (SD)**
Total	3.81 (1.3)	3.61 (1.2)	3.71 (1.2)	3.57 (1.1)	3.64 (1.3)	3.62 (1.1)	3.83 (1.2)	3.60 (1.3)	3.64 (1.3)	3.83 (1.3)	3.68 (1.3)
N	1547	520	1195	2596	878	2798	2941	3212	4386	1919	21992
Safety domains											
Job Satisfaction	4.33 (1.1)	3.85 (1.0)	4.11 (0.9)	3.91 (1.1)	4.42 (0.9)	4.04 (1.1)	4.19 (1.1)	3.97 (1.1)	4.05 (1.2)	4.36 (0.9)	4.10 (1.1)
N	248	85	194	420	144	450	472	515	713	312	3553
Perception of management	3.81 (1.2)	3.37 (1.1)	3.55 (1.2)	3.56 (1.0)	3.60 (1.2)	3.52 (1.1)	3.79 (1.2)	3.49 (1.3)	3.48 (1.3)	3.76 (1.2)	3.59 (1.2)
N	244	82	190	420	143	436	460	514	696	304	3489
Safety Climate	4.01 (1.2)	3.92 (0.9)	3.89 (1.1)	3.57 (1.2)	3.67 (1.2)	3.66 (1.1)	3.95 (1.1)	3.69 (1.3)	3.67 (1.3)	3.91 (1.1)	3.76 (1.2)
N	352	119	270	588	199	641	669	725	987	438	4988
Stress Recognition	2.80 (1.5)	2.97 (1.5)	3.26 (1.5)	3.34 (1.1)	2.57 (1.5)	3.18 (1.3)	3.18 (1.5)	3.25 (1.4)	3.21 (1.4)	3.24 (1.5)	3.17 (1.4)
N	201	67	155	331	112	354	381	413	560	243	2817
Teamwork Climate	3.93 (1.3)	3.86 (1.1)	3.90 (1.1)	3.67 (1.2)	3.85 (1.2)	3.65 (1.1)	3.94 (1.2)	3.67 (1.3)	3.79 (1.3)	3.96 (1.2)	3.80 (1.2)
N	300	100	234	497	169	555	585	627	860	373	4300
Work condition	3.7 (1.4)	3.3 (1.2)	3.3 (1.2)	3.2 (1.2)	3.3 (1.4)	3.5 (1.1)	3.7 (1.2)	3.3 (1.4)	3.5 (1.4)	3.5 (1.4)	3.5 (1.3)
N	202	67	152	340	111	362	374	418	570	249	2845

M: Mean score **SD:** Standard Deviation

7.5.3. Safety domains by job role, years of experience, and nationality

It can be seen from Table 7.4 that there is no significant difference (t=0.21, p=0.84) in the overall safety score between physicians and nurses. However, physicians have significantly higher safety scores compared to nurses in stress recognition (t=4.53, P= <0.001) and teamwork climate (t=3.01, P=0.003). Nurses, on the other hand, have a more positive perception about safety culture in job satisfaction (t=3.10, P <0.001) and work conditions (t=4.29, P=<001). There is no significant difference between nurses and physicians in the other two safety domains, perception of management and safety climate.

Also, the overall safety score for the non-Omani participants (3.85) was significantly higher (t=12.08, p=<0.001) compared with Omani participants (3.57). This finding was consistent across the all the safety domains except the stress recognition where Omani participants (3.28) had a higher score compared with non-Omani participants (2.95).

An analysis of variance shows that there is a significant difference in the overall safety score across the different categories in years of experience (F value= 20.26, p=<0.001). This difference was seen in job satisfaction, safety climate, and teamwork climate (F=19.59, 6.81, and 5.94 respectively, p=<0.001) while no significant difference was seen in the other three domains. Post hoc analyses using the Bonferroni post hoc criterion indicated that in the overall safety score and the job satisfaction domain the '*11-20 years of experience'* group had a significantly higher safety score (p=<0.05) compared with the '*< 5 years'*, '*5-10 years*', and *'21 years or more'*. Similar results found regarding the other two domains except that the '*11-20 years of experience*' was not different from the *'21 years or more'*.

Table 7.4: Safety score for safety domains by job role, nationality and years of experience

		Job satisfaction	Perception of management	Safety Climate	Stress Recognition	Teamwork Climate	Work condition	All domains
Physician	M (SD)	4.02 (1.1)	3.57 (1.2)	3.76 (1.3)	3.41 (1.5)	3.92 (1.2)	3.25 (1.4)	3.69 (1.3)
	N	663	655	947	526	821	534	4146
Nurse	M (SD)	4.16 (1.1)	3.62 (1.2)	3.78 (1.2)	3.10 (1.4)	3.78 (1.2)	3.52 (1.3)	3.70 (1.3)
	N	2635	2579	3690	2089	3167	2102	16262
t-value		3.15	1.02	0.61	4.53	3.01	4.29	0.21
P-value		0.0017*	0.3098	0.5442	<0.001*	0.0027*	<0.001*	0.8367
Omani	M (SD)	3.97 (1.1)	3.46 (1.1)	3.62 (1.1)	3.28 (1.3)	3.67 (1.2)	3.25 (1.2)	3.57 (1.2)
	N	695	674	986	550	845	563	4313
Non-Oman	M (SD)	4.35 (1.0)	3.79 (1.2)	4.01 (1.2)	2.95 (1.5)	4.02 (1.2)	3.69 (1.4)	3.85 (1.3)
	N	1315	1296	1848	1042	1594	1051	8146
t-value		8.24	5.79	8.42	4.40	7.04	6.37	12.08
P-value		<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*	<0.001*
<5 years	M (SD)	4.0 (1.1)	3.6 (1.2)	3.8 (1.1)	3.1 (1.3)	3.8 (1.2)	3.5 (1.2)	3.7 (1.2)
	N	987	986	1409	789	1213	794	6178
5 to 10 years	M (SD)	4.0 (1.1)	3.5 (1.2)	3.7 (1.2)	3.1 (1.5)	3.7 (1.2)	3.5 (1.3)	3.6 (1.3)
	N	1162	1130	1620	918	1400	934	7164
11 to 20 years	M (SD)	4.3 (1.0)	3.7 (1.2)	3.9 (1.2)	3.2 (1.4)	3.9 (1.2)	3.4 (1.4)	3.8 (1.3)
	N	933	905	1303	736	1115	741	5733
21 or more	M (SD)	4.0 (1.2)	3.5 (1.3)	3.7 (1.4)	3.1 (1.5)	3.8 (1.4)	3.3 (1.5)	3.6 (1.4)
	N	268	266	376	214	322	212	1658
F value		19.59	1.92	6.81	1.06	5.94	1.57	20.26
p value		<0.001*	0.12	<0.001*	0.37	<0.001*	0.19	<0.001*

: P value <0.005, **M: Mean **SD**: Standard Deviation*

7.5.4. Percentages of positive responses

Table 7.5 shows the percentage of positive responses (strongly agree, slightly agree) across the six safety domains for each hospital. Overall, the percentage of positive response was 57.9% and none of the hospitals had reached the targeted percentage of above 70%. Job satisfaction had the highest percentage (69.8%) of positive responses while stress recognition had the lowest percentage (44.8%). The variation of this percentage within each safety domain across is represented as P-control charts (Figure 7.1 and Figure 7.2). It can be seen from Figure 7.1 that the overall positive percentage for all domains had a special cause variation with H1, H7 and H10 lying above the control limits (representing a positive culture) while H4 was below the lower control limits (representing substandard level). Figure 7.2 shows that the percentage of positive responses in stress recognition is within the control limits reflecting common cause variation but the other domains showed special cause variations. It can be seen that H1 lies above the limits in all dimensions except in stress recognition. Similarly, H7 lies above the limits in work condition and safety climate while H10 lies above the limits in job satisfaction and teamwork. H4 lies below the limits in work conditions and safety climate while H8 lied below the limits in job satisfaction.

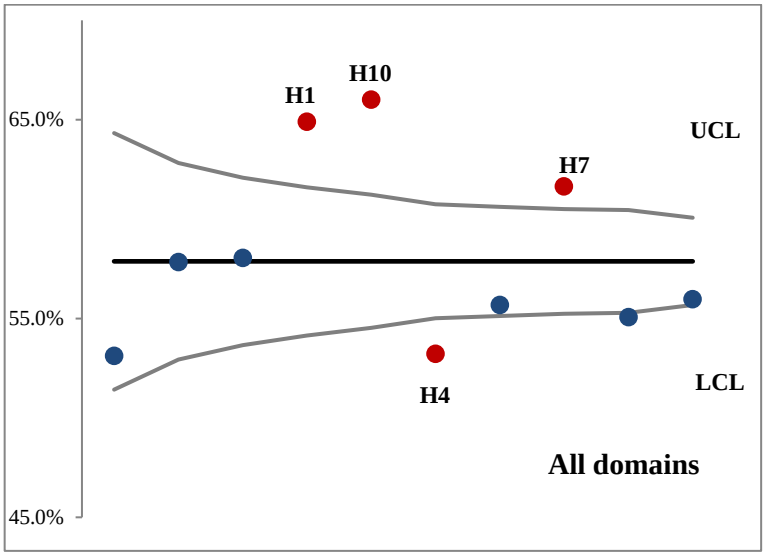

Figure 7.1: P Control charts: overall % of positive response across hospitals

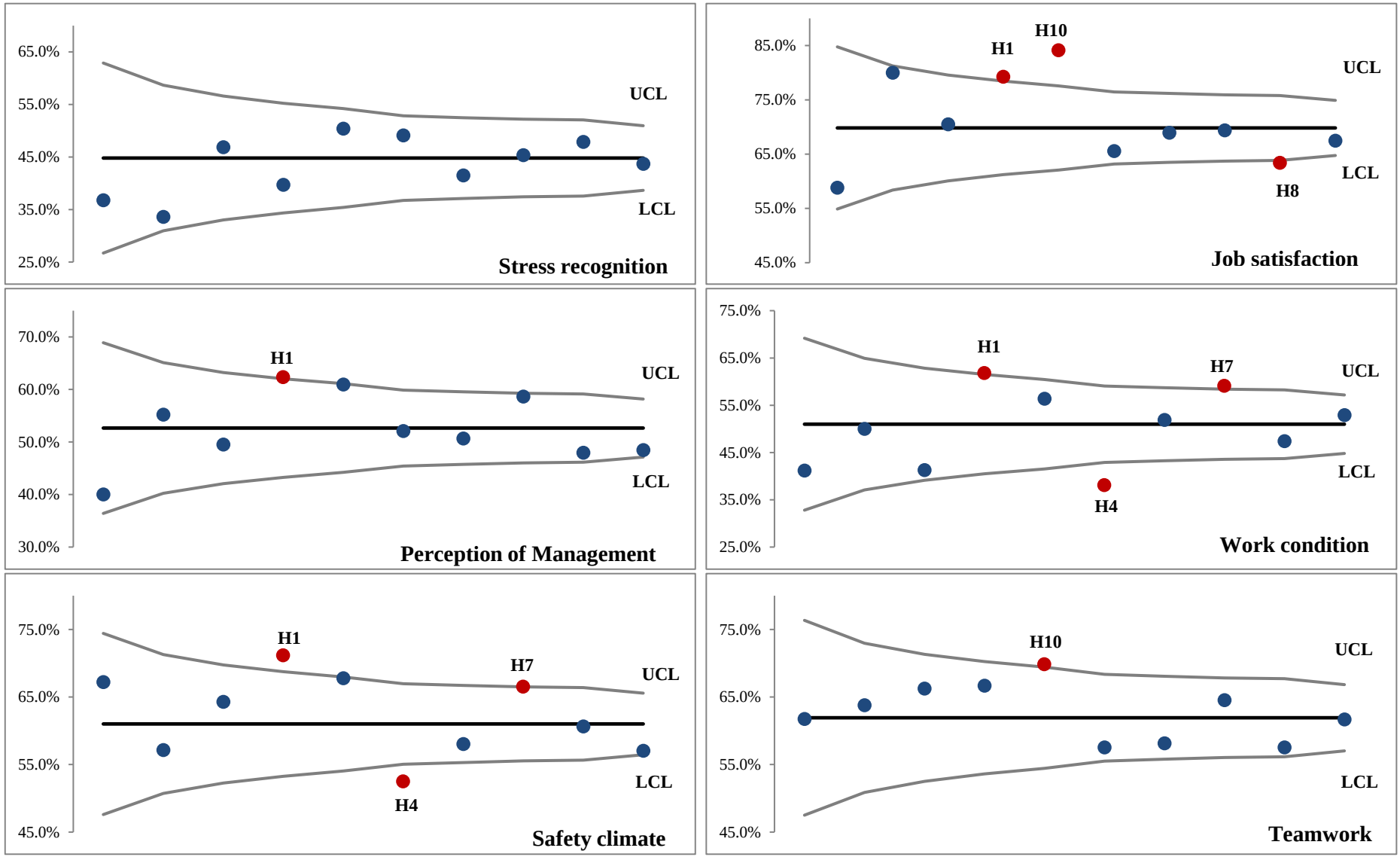

Figure 7.2: P control charts: % of positive responses by safety domains for all hospitals. **UCL:** upper control limit, **LCL:** lower control limit. **Red dots:** % above the control limit

Table 7.5: Percentage of positive/negative response for Safety domains by hospital

	H1 N (%)	**H2** N (%)	**H3** N (%)	**H4** N (%)	**H5** N (%)	**H6** N (%)	**H7** N (%)	**H8** N (%)	**H9** N (%)	**H10** N (%)	**Total** N (%)
All domains	**1581**	**527**	**1240**	**2666**	**899**	**2914**	**3162**	**3286**	**4557**	**1953**	**22785**
Positive	1026 (64.9)	280 (53.1)	720 (58.1)	1419 (53.2)	520 (57.8)	1623 (55.7)	1949 (61.6)	1810 (55.1)	2551 (56.0)	1289 (66.0)	13187 (57.9)
Negative	284 (18.0)	87 (16.5)	187 (15.1)	480 (18.0)	195 (21.7)	471 (16.2)	475 (15.0)	643 (19.6)	903 (19.8)	304 (15.6)	4029 (17.7)
Neutral/Not applicable/Missing	271 (17.1)	160 (30.4)	333 (26.9)	767 (28.8)	184 (20.5)	820 (28.1)	738 (23.3)	833 (25.3)	1103 (24.2)	360 (18.4)	5569 (24.4)
Job Satisfaction	**255**	**85**	**200**	**430**	**145**	**470**	**510**	**530**	**735**	**315**	**3675**
Positive	202 (79.2)	50 (58.8)	141 (70.5)	282 (65.6)	116 (80.0)	324 (68.9)	354 (69.4)	336 (63.4)	496 (67.5)	265 (84.1)	2566 (69.8)
Negative	24 (9.4)	6 (7.1)	9 (4.5)	53 (12.3)	6 (4.1)	42 (8.9)	41 (8.0)	46 (8.7)	78 (10.6)	17 (5.4)	322 (8.8)
Neutral/Not applicable/Missing	29 (11.4)	29 (34.1)	50 (25.0)	95 (22.1)	23 (15.9)	104 (22.1)	115 (22.5)	148 (27.9)	161 (21.9)	33 (10.5)	787 (21.4)
Perception of management	**255**	**85**	**200**	**430**	**145**	**470**	**510**	**530**	**735**	**315**	**3675**
Positive	159 (62.4)	34 (40.0)	99 (49.5)	224 (52.1)	80 (55.2)	238 (50.6)	299 (58.6)	254 (47.9)	356 (48.4)	192 (61.0)	1935 (52.7)
Negative	34 (13.3)	13 (15.3)	32 (16.0)	62 (14.4)	24 (16.6)	73 (15.5)	72 (14.1)	97 (18.3)	149 (20.3)	43 (13.7)	599 (16.3)
Neutral/Not applicable/Missing	62 (24.3)	38 (44.7)	69 (34.5)	144 (33.5)	41 (28.3)	159 (33.8)	139 (27.3)	179 (33.8)	230 (31.3)	80 (25.4)	1141 (31.0)
Safety Climate	**357**	**119**	**280**	**602**	**203**	**658**	**714**	**742**	**1029**	**441**	**5145**
Positive	254 (71.2)	80 (67.2)	180 (64.3)	316 (52.5)	116 (57.1)	382 (58.1)	475 (66.5)	450 (60.7)	587 (57.1)	299 (67.8)	3139 (61.0)
Negative	47 (13.2)	8 (6.7)	34 (12.1)	111 (18.4)	39 (19.2)	92 (14.0)	82 (11.5)	137 (18.5)	194 (18.9)	55 (12.5)	799 (15.5)
Neutral/Not applicable/Missing	56 (15.7)	31 (26.1)	66 (23.6)	175 (29.1)	48 (23.6)	184 (28.0)	157 (22.0)	155 (20.9)	248 (24.1)	87 (19.7)	1207 (23.5)
Stress Recognition	**204**	**68**	**160**	**344**	**116**	**376**	**408**	**424**	**588**	**252**	**2940**
Positive	81 (39.7)	25 (36.8)	75 (46.9)	169 (49.1)	39 (33.6)	156 (41.5)	185 (45.3)	203 (47.9)	257 (43.7)	127 (50.4)	1317 (44.8)
Negative	87 (42.7)	27 (39.7)	48 (30.0)	76 (22.1)	60 (51.7)	115 (30.6)	138 (33.8)	124 (29.3)	179 (30.4)	76 (30.2)	930 (31.6)
Neutral/Not applicable/Missing	36 (17.6)	16 (23.5)	37 (23.1)	99 (28.8)	17 (14.7)	105 (27.9)	85 (20.8)	97 (22.9)	152 (25.9)	49 (19.4)	693 (23.6)
Teamwork climate	**306**	**102**	**240**	**516**	**174**	**564**	**612**	**636**	**882**	**378**	**4410**
Positive	204 (66.7)	63 (61.8)	159 (66.3)	297 (57.6)	111 (63.8)	328 (58.2)	395 (64.5)	366 (57.6)	544 (61.7)	264 (69.8)	2731 (61.9)
Negative	48 (15.7)	18 (17.7)	29 (12.1)	93 (18.0)	30 (17.2)	84 (14.9)	83 (13.6)	129 (20.3)	154 (17.5)	55 (14.6)	723 (16.4)
Neutral/Not applicable/Missing	54 (17.6)	21 (20.6)	52 (21.7)	126 (24.4)	33 (19.0)	152 (27.0)	134 (21.9)	141 (22.2)	184 (20.9)	59 (15.6)	956 (21.7)
Work conditions	**204**	**68**	**160**	**344**	**116**	**376**	**408**	**424**	**588**	**252**	**2940**
Positive	126 (61.8)	28 (41.2)	66 (41.3)	131 (38.1)	58 (50.0)	195 (51.9)	241 (59.1)	201 (47.4)	311 (52.9)	142 (56.4)	1499 (51.0)
Negative	44 (21.6)	15 (22.1)	35 (21.9)	85 (24.7)	36 (31.0)	65 (17.3)	59 (14.5)	110 (25.9)	149 (25.3)	58 (23.0)	656 (22.3)
Neutral/Not applicable/Missing	34 (16.7)	25 (36.8)	59 (36.9)	128 (37.2)	22 (19.0)	116 (30.9)	108 (26.5)	113 (26.7)	128 (21.8)	52 (20.6)	785 (26.7)

7.6. Discussion

This study examined patient safety culture in 10 maternity units in Oman using the safety attitude questionnaire. This study had a high response rate (82%) and showed that the mean safety score varied across hospitals but the overall score was below the targeted score of 4.0 in all hospitals. Across all hospitals, job satisfaction had the highest safety score (4.10) while stress recognition had the lowest score (3.17). The overall safety score was higher among the non-Omani participants and those with 11-20 years of experience. While nurses and physicians had similar overall score, physicians had higher perception in stress recognition domain and nurses had higher score in job satisfaction, teamwork climate and work condition.

P-control chart detected the type of variation in the percentages of positive responses showing that variation was due to special cause in all the safety domains except the stress recognition where variation was due to chance. While three hospitals (H1, H7 and H10) had positive responses above the control limits (representing positive culture), H1 had positive percentage in all safety domains except the stress recognition. This hospital need to be further investigated so that other hospitals (especially those below the limits) can learn from the actions/strategies that made them with these significantly higher percentages. It might be argued that comparing PSC across units and wards might not be useful because results might not reflect true differences/similarities. However, rigorously conducted studies may produce useful information where highest scoring wards/units can share their best practices with the lowest scoring units (Deilkås and Hofoss 2010; Wagner et al. 2013). Thus, comparing results should be with the aim to learn from each other and not to blame or shame any individual or institution. To allow the sharing and learning from each other's best practices, it is important that the study results are used for improvement purposes rather than for rating or legal purposes.

Although the use of control chart has increased and has motivated clinical improvement, its specific use in examining variation in patient safety culture is limited. As emphasised by Duclos and Voirin (2010), the success of using control charts depends on investigating the special cause variation and on leadership commitment for improvement. Future studies are needed to investigate the factors leading to the special cause variation. The tool developed by Mohammed et al. (2005) can be used as a guide for the investigation as discussed in chapter 5 (see Figure 5.3).

Because of the difference in the data collection tool, study settings and study participants, the results in this study could not be compared statistically with the other two studies that were conducted in Oman. However, Al-Mandhari et al. (2014) found that the overall positive responses was 58% which is still low according the tool used in their study despite their indirect reassurance that this level is similar when compared with rates in United States, Taiwan and Lebanon. Similarly, Ammouri et al. (2015) found that the percentages of positive responses in most of the 12 safety domains included in their survey had a rate below 60% and concluded that more work need to be done to improve patient safety culture in Oman.

Results in this study are similar to what was found by Raftopoulos et al. (2011) who studied patient safety culture in maternity units in Cyprus using the SAQ. They found that the safety score across the safety domains was below 4.0 except job satisfaction which had the highest score while stress recognition had the lowest score. They also found that more experienced staff had a higher safety score. At variance with our results, however, Siassakos et al. (2011) found that the highest scored domain was teamwork while perceptions of management had the lowest score. Other studies related to safety culture outside maternity units had similar findings. For example, Elsous et al. (2016) found that safety culture varied greatly across the different hospitals and that job satisfaction had the

highest score. Another example is the study by Jiang et al. (2019) who found that the lowest scored domain was stress recognition.

Sirriyeh et al. (2012) emphasized that existing variations in safety culture between the different groups within a unit or hospital (what the authors call safety subculture) might threaten organizational connection and teamwork which might negatively affect patient safety. Thus, all efforts should be made to unify perceptions about patient safety culture across the different subgroups. A number of interventions can be used to improve overall safety culture or its domains in maternity units as outlined in chapter 30. Selecting the best intervention might be challenging but starting with training and education might be useful especially to improve staff perception about the effect of stress on patient safety (Jiang et al. 2019).

7.7. Study limitations

As it is the case with cross sectional studies, no comments can be made about the reasons for variations across hospitals and different categories of participants. Thus, future qualitative studies are needed to understand these variations. It does, however, alert planner and decision makers that the safety culture level is lower than recommended. Additionally, the findings point to the need for adapting the interventions to the different categories of participants. For example, there is a higher need to improve stress recognition compared with other domains. Similarly, the interventions needed to improve safety culture among less experienced staff might be different from the ones needed for the more experienced.

7.8. Conclusion

Generally, the safety culture varies across maternity units and is below the target in all hospitals. Job satisfaction had the highest safety score while stress recognition was the

lowest. Higher overall score was observed among more experienced and non-Omani participants but no difference was seen between nurses and physicians. Hospitals with positive percentages below the control limits may enhance their culture by learning from hospitals above the control limits. Future studies are needed to examine the reasons for these variations, how best to reduce them, and how to improve safety culture levels.

Chapter 8

The association between nurses' nationality and PSC

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8. Chapter eight: The association between nurses' nationality and patient safety culture

8.1. Abstract

Nurses have a crucial role to play in patient safety culture (PSC) and represent the majority of staff in maternity units. In many countries, nurses are recruited from abroad bringing their own perceptions of PSC. Nonetheless, little is known about the relationship between perceptions of PSC and nurses' nationality. Understanding this relationship will assist stakeholders in designing a responsive program to improve PSC. This chapter uses data from the previous chapter with a specific aim to investigate the association between nurses' nationality and their perceptions about PSC in maternity units in Ministry of Health's hospitals in Oman**. T**he Safety Attitude Questionnaire (SAQ) was distributed to all staff (892 distributed, 735 returned) in 10 maternity units. About three-quarters (74%=541/735) of the returned SAQs were completed by nurses; of whom 33.5% were non-Omani, 21.8% were Omani and 44.7% did not report their nationality. Overall, the mean safety score for non-Omani nurses was significantly higher than the Omani nurses (3.9 vs 3.6, $p<0.001$). Non-Omani nurses have a more positive perception of PSC than Omani nurses in all domains except in respect of stress recognition. In conclusion, decision makers, directors, and clinicians should consider these differences in perceptions when designing interventions to improve PSC (e.g. training, awareness, and orientation plans). Qualitative studies are needed to understand these variations.

8.2. Introduction

Improving staff's perceptions about safety culture has been associated with improved patient safety and better health outcomes (DiCuccio 2015). Since nurses form the majority of the workforce in maternity care and have a crucial influence on patient safety, understanding the factors that affect their perceptions will support patient safety improvement projects (Ridelberg et al. 2014). Variables such as educational level, work hours and years of experience were found to affect nurses' perception (Cox and Flin 1998; Bodur and Filiz 2009; Ari et al. 2011; Ridelberg et al. 2014). Moreover, in countries which rely heavily on nurses from other countries with different cultural and linguistic backgrounds, the perceptions of patient safety may differ between local and international nurses (Almutairi et al. 2013).

Despite the increasing number of studies examining safety culture, studies examining the association between safety culture and nationality/ethnicity of staff are not common (Almutairi et al. 2013). A quick systematic search was conducted in March 2018 to find studies that have examined this association. Table 8.2 summarizes the databases searched, terms used, inclusion/exclusion criteria, and the number of studies found. The search of the literature found seven studies only (Aboshaiqah 2010; Ausserhofer et al. 2012; Almutairi et al. 2013; Kim 2014; Bergs 2015; Vlayen et al. 2015; Skjeggestad et al. 2017). The list of papers considered but excluded after full text review are shown in Appendix 19 with the reason for exclusion.

Out of the seven studies, two were conducted in Saudi Arabia, two in the United States and the remaining were in the, Norway, Belgium, and Switzerland. Four studies focused on variation within nurses and the remaining studies included other different categories of staff. No study focused on a particular unit/department within a hospital. Different tools

were used to examine safety culture among nurses including the Hospital Survey on Patient Safety Culture (HSOPSC), Safety Climate Survey (SCS), and Safety Organizing Scale (SOS) but not the Safety Attitudes Questionnaire (SAQ).

Table 8.1: databases, terms and articles included in the quick systematic search

Databases used	CINAH, Medline, PsycInfo, Embase and ASSIA
Date of search	March 2018
Language	English
Year of publication	No limit was used
Search terms combinations	(Safety culture or safety climate) combined with (ethnic* or rac* or nationality or language)
Total articles found	302
Screened after removing duplicates	206
Considered for full text review	14
Included in the review	7

Aboshaiqah (2010) examined nurses' perception about safety culture in Saudi Arabia and found that the non-Arabic speaking nurses had higher positive response compared to the Arabic speaking nurses. Ari et al. (2011) aimed to study the factors affecting the perception of nurses about safety climate. However, there was no discussion about how ethnicity was associated to safety climate. In Oman, where the present study was conducted, two studies assessed safety culture at the hospital level using the Hospital Survey on Patient Safety Culture but none examined the association between respondents' nationality and safety culture (Almutairi et al. 2013; Al-Mandhari et al. 2014).

8.3. Objectives

This study investigated the association between nurses' nationality and their perceptions about safety culture in maternity care units in Ministry of Health's hospitals in Oman.

8.4. Methods

8.4.1. Research strategy

This is a quantitative cross-sectional study.

8.4.2. Data collection tool

The English short form of the Safety Attitude Questionnaire (SAQ) which has 36 items was used to examine safety climate in this study. A full description of the SAQ was provided in the method section in the previous chapter (see section 7.4.2 see page 107).

8.4.3. Sample and settings

The Sultanate of Oman is an Arabic developing country located in the South-Eastern corner of the Arabian Peninsula. The nursing staff is predominantly female and 42% of nurses working in the Omani Ministry of Health institutions are recruited from countries such as India and the Philippines (MoH 2015a). The study was conducted in all maternity units in the Ministry of Health's hospitals in Oman. The survey targeted bedside nurses, midwives, physicians, students and residents who had worked for a minimum of four weeks before conducting the study.

8.4.4. Statistical analysis

The survey Likert's scales were used to measure the mean score for the 36 safety items except 2, 11, and 36 where the items were appropriately reversely coded as per the guidelines (Sexton 2003). The overall mean scores were calculated by summing up the score (from 1-5) from all respondents and divided by the number of responses. Similarly, the mean score for each safety domain was calculated by adding the scores of items for each domain and divided by the number of responses. To calculate the percentage of positive responses, these responses were regrouped into negative response (strongly disagree, slightly disagree), positive response (strongly agree, slightly agree) and neutral response (Sexton et al. 2006). This study targeted different staff categories, but this paper focuses on nurses as they represent the majority of the workforce and have a major impact on safety culture.

Data were presented as means (SD) and proportions (%). Radar plots were used for data visualization given their usefulness in presenting healthcare data (Saary 2008). Radar plots are circular graphical tool that have a number of rays radiating from the centre and each ray denotes a variable (Saary 2008). T-tests were used to determine the statistically significant differences in mean scores between non-Omani and Omani nurses. Chi-square was used to test for association between variables and statistical significance was set at $p<0.05$. When nurses' nationality and the variables were not reported (missing), data were considered as a separate category in our analysis. All data cleaning and analysis were conducted using StataCorp (2015).

8.5. Results

8.5.1. Survey responses and respondent's characteristics

Out of the 892 targeted population, a total of 735 (82%) questionnaires were returned from the 10 hospitals, of which 541 (74%) were nurses. A breakdown of response rates of each hospital as well as Omani and non-Omani nurses and years of experience are presented in Table 8.2.

Table 8.2: Response rates and respondents' characteristics

Characteristics	Omani Nurses (%)	Non-Omani Nurses (%)	Missing (%)	All (%)	Chi square statistic	P value
	118 (21.8)	181 (33.5)*	242 (44.7)	541 (100)		
Hospital						
H1	15 (12.7)	9 (5.0)	11 (4.6)	35 (6.5)		
H2	0 (0.0)	13 (7.2)	2 (0.8)	15 (2.8)**		
H3	6 (5.1)	7 (3.9)	12 (5.0)	25 (4.6)		
H4	21 (17.8)	5 (2.8)	36 (14.9)	62 (11.5)		
H5	1 (0.9)	8 (4.4)	9 (3.7)	18 (3.3)	52.9	<0.001
H6	16 (13.6)	22 (12.2)	26 (10.7)	64 (11.8)		
H7	16 (13.6)	15 (8.3)	47 (19.4)	78 (14.4)*		
H8	6 (5.1)	41 (22.7)	27 (11.2)	74 (13.7)		
H9	23 (19.5)	44 (24.3)	51 (21.1)	118 (21.8)		
H10	14 (11.9)	17 (9.4)	21 (8.7)	52 (9.6)		
Years of experience					20.8	0.002

<5 years	28 (23.7)	60 (33.2)	73 (30.2)	161 (29.8)		
5 to 10 years	44 (37.3)	60 (33.2)	92 (38.0)	196 (36.2)*		
11 to 20 years	35 (29.7)	51 (28.2)	55 (22.7)	141 (26.1)		
21 or more	5 (4.2)	7 (3.9)	12 (5.0)	24 (4.4)**		
Missing	6 (5.1)	3 (1.7)	10 (4.1)	19 (3.5)		

*: Highest percentage in the category, ****:** Lowest percentage in the category**.**

Table 8.2 shows that the response rate of nurses who identified themselves as non-Omani nurses is higher than that of Omani nurses (34% vs 22%). The majority of respondents were from H9 (21.8%) while H 2 had the lowest representation (2.8%). In all categories of years of experience, the percentage of Omani nurses was higher than the non-Omani nurses except the <5 years of experience where non-Omani nurses formed 33.2% compared to 23.7% Omani nurses.

Table 8.3: Mean safety scores by safety domains and years of experience

	Omani nurses		**Non-Omani nurses**		**Missing**		**All**	
	Mean (SD)	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**	**Mean (SD)**	**N**
All	**3.6 (1.2)**	**4094**	**3.9 (1.3)***	**6411**	**3.6 (1.2)**	**8365**	**3.7 (1.3)**	**18870**
Domain								
Job Satisfaction	4.0 (1.1)	571	4.5 (0.9)	898	4.0 (1.1)	1166	4.2 (1.1)*	2635
Perception of management	3.5 (1.1)	550	3.8 (1.3)	877	3.5 (1.2)	1152	3.6 (1.2)	2579
Safety Climate	3.6 (1.1)	810	4.1 (1.1)	1251	3.6 (1.2)	1629	3.8 (1.2)	3690
Stress Recognition	3.2 (1.3)	451	2.8 (1.5)	712	3.3 (1.4)	926	3.1 (1.4)**	2089
Teamwork Climate	3.7 (1.2)	691	4.0 (1.2)	1076	3.6 (1.2)	1400	3.8 (1.2)	3167
Work condition	3.3 (1.2)	461	3.8 (1.3)	714	3.4 (1.3)	927	3.5 (1.3)	2102
Missing	3.6 (1.2)	560	3.8 (1.2)	883	3.6 (1.2)	1165	3.7 (1.2)	2608
Years of Experience								
<5 years	3.6 (1.1)	955	3.8 (1.2)	2128	3.6 (1.2)	2457	3.7 (1.2)	5540
5 to 10 years	3.6 (1.1)	1534	3.9 (1.3)	2120	3.5 (1.3)	3231	3.6 (1.3)**	6885
11 to 20 years	3.7 (1.2)	1229	3.9 (1.3)	1819	3.7 (1.3)	1928	3.8 (1.3)*	4976
21 or more	3.4 (1.2)	176	3.8 (1.4)	237	3.7 (1.4)	424	3.6 (1.4)**	837
Missing	3.3 (0.9)	200	4.1 (1.0)	107	3.4 (1.0)	325	3.5 (1.0)	632

*SD: Standard Deviation, *: highest score in the category, **: lowest score in the category*

8.5.2. Safety score for safety domains, years of experience and the 36 items

Table 8.3 shows that the non-Omani nurses had a significantly higher overall mean score (3.9) compared with the Omani nurses (3.6). Among the Omani and non-Omani nurses,

job satisfaction (4.2) had the highest mean score while stress recognition (3.1) had the lowest score. However, non-Omani nurses had a lower mean score for stress recognition than Omani nurses (2.8 vs 3.2). With the exception of the stress recognition domain, the non-Omani nurses had significantly higher mean scores compared with the Omani nurses in five of the six safety domains. These differences were all statistically significant with a p-value <0.001 (see Table 8.3 and Figure 8.1).

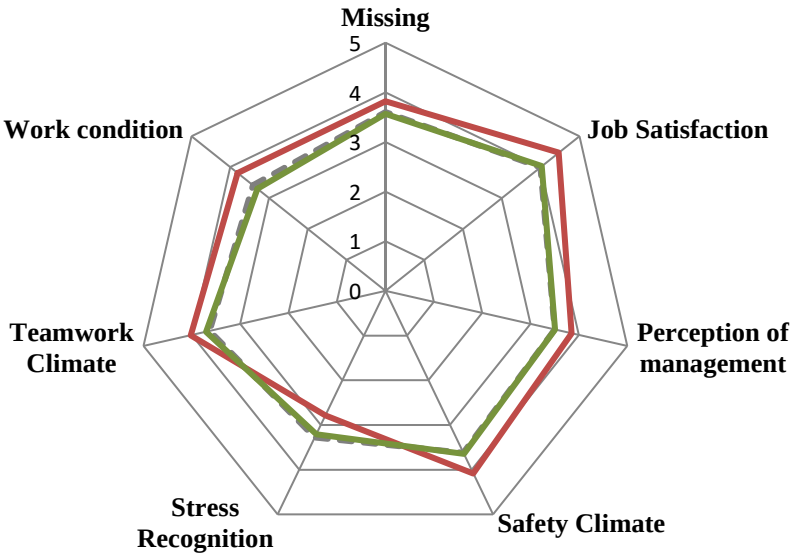

Figure 8.1: Radar plot showing the mean scores for safety domains by nationality *(Red solid line: Non-Omani nurses, Green solid line: Omani nurses, Grey dotted line: Missing. p<0.001 for all domains)*

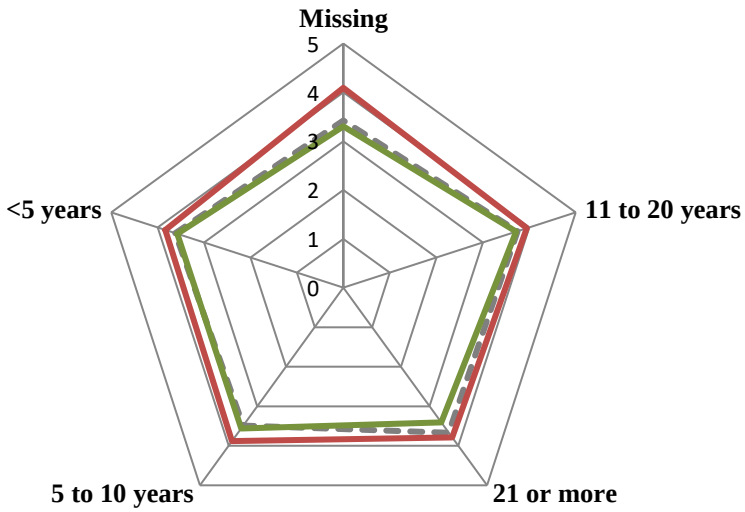

Figure 8.2: Radar plot showing the mean scores for years of experience categories by nationality (*Red solid line: Non-Omani nurses, Green solid line: Omani nurses, Grey dotted line: Missing. p<0.005 for all categories)*

The non-Omani nurses had significantly higher mean scores across all the categories of experience compared with Omani nurses (Table 8.3 and Figure 8.2).

Moreover, the non-Omani nurses had a significantly higher mean score across all the 36 safety items except items number 20-23 which are part of the stress recognition domain (see Appendix 20 and Appendix 21).

Table 8.4: Percentage of responses for each safety domain by nationality

Domain	**Omani nurses (%)**	**Non-Omani nurses (%)**	**Missing (%)**	**All (%)**
All domains	**3658**	**5611**	**7502**	**16771**
Positive	2047 (56.0)	3755 (66.9)	4016 (53.5)	9818 (58.5)
Negative	598 (16.3)	895 (16.0)	1403 (18.7)	2896 (17.3)
Neutral/missing/not applicable	1013 (27.7)	961 (17.1)	2083 (27.8)	4057 (24.2)
Job Satisfaction	**590**	**905**	**1210**	**2705**
Positive	419 (71.0)	747 (82.5)	803 (66.4)	1969 (72.8)
Negative	48 (8.1)	28 (3.1)	137 (11.3)	213 (7.9)
Neutral/missing/not applicable	123 (20.8)	130 (14.4)	270 (22.3)	523 (19.3)
Perception of management	**590**	**905**	**1210**	**2705**
Positive	291 (49.3)	573 (63.3)	582 (48.1)	1446 (53.5)
Negative	79 (13.4)	131 (14.5)	212 (17.5)	422 (15.6)
Neutral/missing/not applicable	220 (37.3)	201 (22.2)	416 (34.4)	837 (30.9)
Safety Climate	**826**	**1267**	**1694**	**3787**
Positive	489 (59.2)	931 (73.5)	931 (55.0)	2351 (62.1)
Negative	130 (15.7)	138 (10.9)	297 (17.5)	565 (14.9)
Neutral/missing/not applicable	207 (25.1)	198 (15.6)	466 (27.5)	871 (23.0)
Stress Recognition	**472**	**724**	**968**	**2164**
Positive	207 (43.9)	275 (38.0)	444 (45.9)	926 (42.8)
Negative	122 (25.9)	319 (44.1)	281 (29.0)	722 (33.4)
Neutral/missing/not applicable	143 (30.3)	130 (18.0)	243 (25.1)	516 (23.8)
Teamwork Climate	**708**	**1086**	**1452**	**3246**
Positive	427 (60.3)	764 (70.4)	802 (55.2)	1993 (61.4)
Negative	113 (16.0)	148 (13.6)	269 (18.5)	530 (16.3)
Neutral/missing/not applicable	168 (23.7)	174 (16.0)	381 (26.2)	723 (22.3)
Work condition	**472**	**724**	**968**	**2164**
Positive	214 (45.3)	465 (64.2)	454 (46.9)	1133 (52.4)
Negative	106 (22.5)	131 (18.1)	207 (21.4)	444 (20.5)
Neutral/missing/not applicable	152 (32.2)	128 (17.7)	307 (31.7)	587 (27.1)

Table 8.4 shows the that 58.5% of nurses rated safety culture as positive but was higher among non-Omani nurses (67%) compared with the Omani nurses (56%). The percentage of positive responses for all safety domains was below 75%. The domain that had the highest positive percentage was job satisfaction (73%) followed by safety climate (62.1%) while stress recognition had the lowest percentage (43%). The positive percentage in all safety domains was higher among non-Omani nurses except the stress recognition domain where 43.9% of Omanis nurses agreed that safety culture was positive compared with 38.0% non-Omani nurses.

8.6. Discussion

This chapter has examined nurses' perception about patient safety culture in maternity units in Oman. It was found that the overall mean score of patient safety among nurses was not positive (i.e. below 4.0). However, the non-Omani nurses had a positive perception (4.0 or above) for three domains: job satisfaction, safety climate, and teamwork climate while the Omani nurses had a positive score in the job satisfaction domain. While job satisfaction had the highest mean score, stress recognition had the lowest score across the Omani and non-Omani nurses. Interestingly, the Omani nurses had a higher score in the stress recognition domain compared with the non-Omani nurses.

The study findings suggest that there is an association between the nationality of nurses and their perception of safety culture. Other studies support this finding even though different surveys were used to measure safety culture. For example, Almutairi et al. (2013) conducted a study in Saudi Arabia using the safety climate survey and examined the perception of safety culture among nurses of diverse backgrounds. They found that there was a significant variation between nurses of different backgrounds. However, it was not reported which category had a more positive perception. Another study in Saudi

Arabia by Aboshaiqah (2010) concluded that the scores of the patient safety culture domains were significantly higher for non-Arabic speaking nurses than Arabic speaking nurses, but without reporting the country of origin. Similarly, a recent study by Wagner et al. (2017) used the HSOPSC to examine the safety culture perceptions among US and immigrant nurses. They found that immigrant nurses had a more positive perception. Yi and Jezewski (2000) conducted an ethnographic study to examine how Korean nurses adapted to US hospitals and found that the Korean nurses brought their own culture (i.e. beliefs, values, perceptions) with them. Although their study was not specific to safety culture, but culture in general, it emphasizes that immigrant nurses do have different perceptions especially during the first 5 years of their stay.

This study is a national study focusing on a specific, but important, aspect of service which is maternity care. It has a good response rate indicating the feasibility for continuous monitoring of safety culture in maternity units as well as other units. It informs different stakeholders and researchers on the areas of patient safety that need more attention for each group of nurses (i.e. Omani and non-Omanis). It also emphasises the need to consider the nationality of staff when considering initiatives to improve safety and safety culture.

8.7. Study limitations

The main limitation of this study is the high percentage of nurses (44.7%) that did not report their nationality. However, other studies had similar issues. For example, Almutairi et al. (2013) had 53% of participants who did not report their nationality. In our study, the perception of safety culture among those with unreported nationality was very similar to the Omani nurses which may indicate that the majority of those nurses were Omani. Another limitation, as is the case with other similar studies, is that the reasons for the

variations between nationalities could not be explained by cross sectional studies. The higher chance for training and exposure might represent a potential explanation for the lower score among the non-Omani with regard the stress recognition. However, further studies will be needed to examine the reasons for these variations and to determine if these variations are warranted (good) or unwarranted (bad) (Appleby et al. 2011).

8.8. Conclusion

The nationality of nurses has an influence on their perception about safety culture. Stress recognition is one safety domain that needs attention from different stakeholder with special attention on the non-Omani nurses. Decision makers, executive directors, and clinicians need to consider these differences in perception when designing any interventions to improve safety culture (e.g. training programme, awareness events and orientation plans). Future studies are needed to explain the reasons for the variation of perception between Omani and non-Omanis nurses with measures to ensure lower rates of missing data.

Chapter 9

Validating an Arabic survey to measure maternal childbearing satisfaction

The material presented in this chapter is under review in the

Eastern Mediterranean Health Journal

9. Chapter nine: Validating an Arabic survey to measure maternal childbearing satisfaction

9.1. Abstract

There is an increasing emphasis on measuring maternal satisfaction in Arab countries as an essential indicator of care quality. However, existing surveys have limited psychometric properties and limited inclusion criteria. This chapter presents the translation and validation of an Arabic survey to measure women's satisfaction with care during childbirth. An Arabic Childbirth Care Satisfaction Survey (CCSS) was developed and translated from two validated English surveys. To establish face and content validity, thirteen mothers were asked to rate the survey items in terms of clarity, importance, and acceptability. The CCSS was distributed on the discharge date to all mothers who delivered a live baby during the four weeks study period in nine hospitals in Oman. A sample of 461 participants were used for Principal Confirmatory Analysis (PCA) while another 408 was used for Confirmatory Factor Analysis (CFA), and two samples independent t-tests were conducted to establish discriminant validity. The survey demonstrated good face and content validity with all items rated above 3.0 (out of 5) in terms of clarity, importance, and acceptability. Of the 3566 targeted population, 958 (26.9%) mothers participated. PCA suggested two factors labelled as '*communication and control*' (Cronbach's alpha=0.90), and '*care organisation*' (Cronbach's alpha=0.68) as having good internal reliability. CFA showed this model to be a good fit and consequently, confirming construct validity. Independent t-tests showed that mothers who had vaginal delivery were significantly more satisfied compared with caesarean section, thus establishing good discriminant validity for the CCSS. In conclusion, a short and easy to use Arabic childbirth care satisfaction survey to measure maternal satisfaction with the childbearing experience has been developed. This new 10-item tool has good face and content validity, good internal reliability, construct validity and discriminant validity. It can provide valuable information to clinicians and decision makers about the quality of maternity services.

9.2. Introduction

Patient satisfaction is an important measure of quality in health care that can be used for further improvement and research (Beattie et al. 2015). As shown in the literature review in chapter 4 and despite the extensive work related to satisfaction of mothers' maternity care, there are few Arabic surveys available to measure satisfaction. There are 26 countries where Arabic is officially recognized by the government, with 18 having a majority of their people using it as their first language (Worldatlas 2018). A recent review by Hussein et al. (2018) examined the studies related to maternal satisfaction in the Middle East but did not assess the quality of the surveys but rather focused on identifying components of satisfaction.

The systematic review by Sawyer et al. (2013) found nine instruments that can be used to measure satisfaction with care during labour and childbirth. Among the nine surveys, they concluded that the Six Simple Questions (SSQ) and Patient Perception Score (PPS) are brief, easily administered, and have good reliability and validity. Although other tools included in their systematic review have high reliability and validity, they were lengthy, designed for a specific condition (e.g. caesarean section), or developed for a very specific group of patients (uncomplicated vaginal deliveries with healthy born babies).

9.3. Objective

This paper presents the translation and validation of an Arabic survey to measure women's satisfaction with care during childbirth based on the SSQ and PPS

9.4. Methods

9.4.1. Survey development

The survey items were taken by merging items from two validated English questionnaires, PPS (see Appendix 22) and SSQ (see Appendix 23). The reason for merging the two tools was to cover domains that were not covered by the other survey. The SSQ was developed by Harvey et al. (2002) to measure satisfaction of mothers with childbirth at 48 hours, 2 weeks and 6 weeks postpartum. As the name implies, the tool consists of six questions that are scored on a seven points scale. Two questions were negatively worded. The SSQ was found to have high reliability with a Cronbach's alpha of 0.86. The PPS was developed by Siassakos et al. (2009) to measure mother's perceptions following operative childbirth. The questionnaire has three questions each measuring one domain using a five-point Likert's scale. The domains measured are: communication, respect, and safety. The three items of the tool were found to have good internal consistency with a Cronbach's alpha of 0.83 and established face validity. Additionally, the authors reported that participants found it easy and simple to complete the questionnaire.

After combining the two survey, three items from the PPS (item 1, 2 and 3) were slightly re-worded, and one item was split into two (item 4). The resulting combined tool referred to as the Childbirth Care Satisfaction Survey (CCSS) had ten items. Instead of the five-point scale in the original PPS, 7-points were used to match the scales of the SSQ. Compared with the five-point scale, the seven-point scale is believed to provide a more accurate and sensitive measure of a participant's evaluation (Finstad 2010). The survey had other items related to participants' educational level, employment status, number of babies in this delivery, number of previous deliveries, and the type of delivery. Before finalizing the CCSS, the English version was translated into Arabic, validated and pilot tested. The following sections describe these steps in more details.

9.4.2. Translation of the tool

The majority of participants are expected not to be fluent in English, hence the need for translation into the Arabic language (McColl et al. 2002). Compared with other techniques like forward-only translation, back translation is suggested to be the most reliable technique to avoid possible translation errors (Maneesriwongul and Dixon 2004). In back translation, the original survey is translated into the targeted language. The survey in the targeted language is then translated back into the original language by another individual (Maneesriwongul and Dixon 2004). In this study, the questionnaire was translated into Arabic by two individuals (both researchers are fluent in both languages). The translated version was then sent to a Medical Doctor who is fluent in Arabic and English. The back-translated version was checked by the researcher and found to be consistent with only few words that required amendments.

9.4.3. Face and content validity of the Arabic-version questionnaire

Once the tool was translated into Arabic, it was tested to determine face and content validity. Thirteen Omani mothers who had a previous delivery in Oman were conveniently contacted and requested to rate the survey items on a voluntary basis. Mothers were asked to rate each question from 1-5 in terms of clarity, acceptability, and importance. Results showed that all survey items had an average score above 3.0 in terms of clarity, importance, and acceptability. The format of the questionnaire that was sent to those mothers can be seen in Appendix 24. The final English and Arabic translated versions of the SSQ and PPS can be seen in Appendix 25 and Appendix 26.

9.4.4. Design

This study is a descriptive cross-sectional design.

9.4.5. Sample and settings

This national study was piloted in March 2017 in one hospital before including the remaining nine secondary care hospitals that are under the umbrella of the Ministry of Health, Oman. The whole study in the other hospitals was conducted from April-June 2017. The study targeted all mothers who gave a live birth (whether vaginal delivery or caesarean section) during the study period (four weeks in each hospital). Mothers who do not read Arabic were asked to get help from their attending relative (mother, husband, sister, *etc.*). If they have no relative to help them in completing the survey, they were excluded from the study.

9.4.6. Distribution and Data entry

Questionnaires were given by the researcher to the head of Quality departments in the participating hospitals who, in turn, gave it to the ward in-charge for distribution to mothers. A distribution plan was provided to heads of Quality departments to ensure consistency of distribution. As detailed in the plan, the surveys were handed to the mothers on their date of discharge (usually 36-48 hours after admission). Data was entered in a pre-prepared Microsoft Excel sheet by a coordinator who was trained on data entry and the researcher double checked 10% of surveys entered to ensure accuracy.

9.4.7. Data analysis

Data from the pilot site were included in the data analysis. Two items, Q3 and Q6, were negatively worded and thus reverse coded. The seven points Likert scale of responses ranged from strongly disagree (1) to strongly agree (7). The scales were used to measure the mean satisfaction score by adding up the scores given by each respondent for each question and dividing it by the number of respondents for that question. Similarly, the total satisfaction score is calculated by taking the average of scores for all survey items for each hospital. Participants are considered satisfied, if the mean score was above the

midpoint response (i.e. above 4.0). Since one of the hospitals had very few participants (only four), it was dropped from the analysis. Thus, data presented in this paper is confined to nine hospitals where 958 mothers participated in the study. The participating hospitals are coded from H1-H9 to ensure confidentiality.

The first sample of 461 participants were recruited from H1-H4 and this sample was used to conduct Principal Component Analysis (PCA) using StataCorp (2015). PCA was conducted using oblique (Oblimin) rotation to examine the internal structure of the CCSS scale and how each item contributes to the construct. The Kaiser-Meyer-Olkin (KMO) Test was used to assess sample adequacy where a value of 0.8 or more represent a good sample size. Eigenvalues of one or above were used to retain the factor and items were retained if they had a factor loading of 0.30 or above as recommended by Field (2013). Cronbach Alpha was used to assess the internal reliability of the scale and the retained factors. As recommended by Pallant (2013), an alpha value of 0.8, 0.7, and 0.6 indicates a good, satisfactory, and poor reliability respectively.

Another sample of 497 women was recruited from H5-H9. After removing missing data, 408 out of the 497 samples were used for Confirmatory Factor Analysis (CFA) to examine construct validity. Amosv.22 was used to assess the CFA using maximum likelihood estimation. Testing the model fit followed the guidelines of Hooper et al. (2008) as follows: a Chi-square to Degree of Freedom ratio (CMIN/DF) $\leq$2.00, the Goodness of Fit Index (GFI) $\geq$0.90, the Comparative Fit Index (CFI) $\geq$0.90, the Standardized Root Mean Square Residual SRMR$\geq$0.05 and the Root Mean Square of Approximation (RMSEA) $\geq$0.05. Two sample independent t-tests were conducted to assess the discriminant validity where the null hypothesis was that there is no difference in the satisfaction score between vaginal and caesarean delivery. Statistical significance was set at $p<0.05$.

9.4.8. Ethics, confidentiality, and anonymity

This study was approved by the Ministry of Health in Oman as well as by the University of Bradford. An information sheet was provided in front of the questionnaire to explain the purpose and importance of the study. The information sheet also emphasizes that participation is voluntary and will not negatively affect them in any way in the future. To ensure confidentiality and anonymity, participants were not asked to provide any information that can identify them like name, identification number, address, or mobile number.

9.5. Results

9.5.1. Respondent's characteristics and response rate

Out of the 3566 targeted population, 958 (26.9%) mothers participated in the study in the nine hospitals. Across hospitals, response rate ranged from 18% to 79%. Table 9.1 presents the demographic data for sample 1 and sample 2. Out of 958, the majority of respondents were not employed (67.0%), having primary to tertiary level of education (62.5%), did not have a chronic condition (87.7%), this delivery was not their first delivery (72.7%), had single baby (86.4%), a vaginal delivery (70.0%), and this delivery was not their first delivery in the hospital (59.4%). Participants in both samples had similar characteristics (See Table 9.1).

Table 9.1: Characteristics of participants

Characteristic	**Sample 1 N (%)**	**Sample 2 N (%)**	**Both samples N (%)**
	461	497	958
Education level			
No education	5 (1.1)	13 (2.6)	18 (1.9)
Primary/secondary/tertiary school	284 (61.6)	315 (63.4)	599 (62.5)
Graduate/Postgraduate	168 (36.4)	163 (32.8)	331 (34.6)
Missing	4 (0.9)	6 (1.2)	10 (1.0)
Employment status			
Employed	132 (28.6)	136 (27.4)	268 (28.0)
Not employed	302 (65.5)	340 (68.4)	642 (67.0)
Retired	5 (1.1)	3 (0.6)	8 (0.8)
Missing	22 (4.8)	18 (3.6)	40 (4.2)
Do you Have a chronic condition			
Yes	38 (8.2)	44 (8.9)	82 (8.6)
No	400 (86.8)	440 (88.5)	840 (87.7)
Missing	23 (5.0)	13 (2.6)	36 (3.8)
Is this your first delivery?			
Yes	126 (27.3)	107 (21.5)	233 (24.3)
No	318 (69.0)	378 (76.1)	696(72.7)
Missing	17 (3.7)	12 (2.4)	29 (3.0)
Babies delivered this time			
Single baby	393 (85.3)	435 (87.5)	828 (86.4)
Twins	8 (1.7)	10 (2.0)	18 (1.9)
Triplets or more	37 (8.0)	35 (7.0)	72 (7.5)
Missing	23 (5.0)	17 (3.4)	40 (4.2)
Mode of delivery			
Vaginal	310 (67.3)	361 (72.6)	671 (70.0)
Caesarean	130 (28.2)	124 (25.0)	254 (26.5)
Missing	21 (4.6)	12 (2.4)	33 (3.4)
Is this your first delivery in this hospital?			
Yes	193 (41.9)	170 (34.2)	363 (37.9)
No	253 (54.9)	316 (63.6)	569 (59.4)
Missing	15 (3.3)	11 (2.2)	26 (2.7)

9.5.2. Study 1: Exploring the factor structure of the CCSS

Factor structure of the CCSS was examined using a sample of 461 participants. The sample size was found to be adequate (KMO = 0.883) to conduct PCA which suggested two factors with eigenvalues above 1.0. Factor 1 and factor 2 explained 50% and 16% of the variance respectively. Using an eigenvalue of at least 0.3, a total of 8 items loaded

onto factor 1(labelled as Communication and control) and two items loading onto factor 2 (labelled as care organisation). Although item number 5 (*'I felt involved in the procedures related to my care*') did not reach the threshold eigenvalue, due to its theoretical importance and the proximity to the threshold value (0.29) it was kept in the survey. Factor 1 had a Cronbach's alpha of 0.90 while factor 2 had a score of 0.68 representing good internal reliability. As factor 2 had only two items, the average inter-item correlation was explored and found to be 0.52 which is above the optimum range of 0.2 to 0.4 (Briggs and Cheek 1986). This suggests that the two items are too closely related. Factor loading is presented in Table 9.2.

Table 9.2: Factor loadings based on sample 1 data (461 participants)

Item	Variable	Factor 1	Factor 2
1	I felt that I had adequate control over my care	0.33	
2	The staff(s) responsible for my care were caring and compassionate	0.37	
3	Problems arose were not dealt with effectively		0.69
4	My needs have been addressed with appropriate consideration for my time	0.35	
5	I felt involved in the procedures related to my care	0.29	
6	The overall organization of my care has not been appropriate		0.69
7	I would choose the same type of care for my next pregnancy	0.37	
8	I felt safe at all times	0.38	
9	I felt well informed due to good communication	0.34	
10	I felt I was treated with respect at all times	0.38	

9.5.3. Study 2: Testing the validity of the factor structure

On a separate sample of 408 mothers CFA was used to test a two-factor model using maximum likelihood estimation. The CFA showed the data fits the model well (χ^2 (89) = 56.26, p <0.001; CMIN/DF =2.16; GFI = 0.97, CFI = 0.93, SRMR = 0.06 and RMSEA = 0.05), thus demonstrating good construct validity.

9.5.4. Discriminant validity

Two sample independent t-test using data from both samples was conducted and showed that the mean satisfaction score was significantly higher among those who had vaginal delivery (5.42) compared with caesarean delivery (5.32) (t= 2.10, p = 0.036).

9.6. Discussion

Currently, there are few Arabic surveys to measure maternal satisfaction in Arabic countries despite the fact that the Arabic language is used by the majority of people in 18 countries. This study aimed to address this gap by describing the psychometric properties of an Arabic survey developed by combining two existing tools to measure maternal satisfaction in nine maternity units in Oman. The survey showed good face and content validity. The PCA showed that the new survey was based on an adequate sample size and the ten items loaded into two factors labelled as communication and control (8 items), and care organization (2 items). Both factors have good internal reliability with a Cronbach's alpha of 0.90 for communication and control while care organization had a score of 0.68. The measures of the CFA confirmed that the model fits well demonstrating good construct validity. Additionally, the survey has good discriminant validity as shown by the two way independent t-test between mothers who had vaginal delivery and those with caesarean section. Studies suggest that women are more satisfied after a vaginal delivery compared with caesarean section (Geary et al. 1997; Guittier et al. 2014). The new scale was sensitive enough to pick up this difference and results confirmed the existing literature about Omani women's preference towards vaginal delivery found by Mathew et al. (2002).

9.7. Study limitations

The study has two main limitations. First, the study has 26.9% response rate which might be considered low. Nonetheless, the sample size (n=958) made the psychometric testing possible as evidence by the KMO test. Second, this survey was given to mothers on their date of discharge (i.e. 36 to 48 hours after delivery). Thus, results might not be applicable if used to measure satisfaction two weeks or two months after delivery. Despite these limitations, we believe that the new tool has good psychometric properties and might be of some use in follow up studies. Unlike other studies, our study did not exclude complicated vaginal deliveries making the results applicable to all deliveries. Although the new survey was tested in Oman only, the new CCSS can still be applied in Arab-Speaking countries because it was written in classical Arabic which is the formal language spoken in formal speeches and in printed publications like books, newspapers and magazines with minor differences across the Arab countries (Warschauer et al. 2002). This would enhance the generalisability of the CCSS, without the need for further modifications or corrections.

9.8. Conclusion

A short and easy to use Arabic childbirth care satisfaction survey to measure maternal satisfaction with the childbearing experience has been developed. This new 10-item tool has good face and content validity, good internal reliability, construct validity and discriminant validity. It can provide valuable information to clinicians and decision makers about the quality of maternity services. The next chapter presents mothers' satisfaction level and the factors affecting their satisfaction as assessed by the newly developed CCSS.

Chapter 10

Maternal satisfaction in maternity units in Oman

The material presented in this chapter is under review in the

Maternal and Child Health Journal

10. Chapter ten: Maternal satisfaction in maternity units in Oman

10.1. Abstract

Despite the increasing interest, little is known about mother's satisfaction about childbearing in developing countries. Knowing their satisfaction level will guide service planning and improvement. This chapter presents the study conducted to establish a baseline mother's satisfaction level in Oman and to examine if mothers' characteristics have any relation with satisfaction. The Childbirth Care Satisfaction Survey (CCSS) was distributed to mothers who delivered a live baby during the study period in Ministry of Health's hospitals in Oman. Out of the 3566 targeted population, 958 (26.9%) mothers participated. Of these 958, 67.0% were not employed, 62.5% had primary to tertiary education level, 87.7% did not have a chronic condition, 72.7% this delivery was not their first delivery, 70.0% had a vaginal delivery, and 59.4% this delivery was not their first delivery in the hospital. The overall satisfaction score was 5.4. The two areas that had least satisfaction score were: response to problems encountered by mothers (4.5) and the organization of care (4.9). Overall, mothers who delivered vaginally, had a previous delivery, or delivered previously in the same hospital were significantly more satisfied compared with mothers who had caesarean section delivery, delivered for the first time, or delivered in the hospital for the first time. No difference in satisfaction was observed between mothers with and without chronic condition. Proportional control chart showed that across all survey items, the percentage of positive response for all hospitals were within the control limit except H7. In conclusion, mothers' satisfaction about childbearing in Oman is high. Future studies need to examine how to improve the areas with lowest satisfaction and to understand the variation in satisfaction score across different categories of participants and between hospitals.

10.2. Introduction

As outlined in the literature review in chapter 4, satisfaction with childbearing care is associated with positive outcomes to the mothers as well as their children and non-satisfaction can be associated with negative consequences like postpartum depression and anxiety. Thus, ensuring maternal satisfaction should become a priority if quality and safety of maternal services are to be enhanced.

Despite the increasing emphasis in measuring women's satisfaction, women's voice in the Middle East is criticised for being underreported and concerns were raised about negative childbirth experience (Jahlan et al. 2016; Hussein et al. 2018). For example, Mohammad et al. (2013) found that around 76% of women were dissatisfied with antenatal care. Thus, more studies are required to understand the situation of maternal satisfaction in these countries.

Oman, a country in the Middle East, has adopted a number of initiatives to improve maternity services and was reported to be the most improved country during 1971-2010 according to the health development report of 2010 by the United Nations Children's Fund (Aty et al. 2014). However, and despite the increasing attention about incorporating patients' voice, studies reporting women's satisfaction in Oman are few. Ghobashi and Khandekar (2008) examined the satisfaction of pregnant women about antenatal care while Al-Mandhari et al. (2004) and Albalushi et al. (2012) examined satisfaction of service users with the quality of care in primary healthcare institutions. In all the three papers, the study was confined to one of the ten Governorate in Oman and none of the studies examined childbearing experience of women in hospitals.

10.3. Objectives

This study attempts to fill this gap in the literature by examining women's satisfaction about their childbearing experience. The specific objectives are:

- To establish a baseline maternal satisfaction level with care provided during childbirth.
- To study the variation of positive maternal responses across the ten participating hospitals
- To test the association between women's characteristics and maternal satisfaction.

10.4. Methods

10.4.1. Design

This study is a descriptive cross sectional type.

10.4.2. Data collection tool

For this study, the Childbirth Care Satisfaction Survey (CCSS) was developed and used to measure maternal satisfaction about childbearing experience. The validation process and the psychometric properties of the CCSS are described in chapter 9. The survey has 10 items total measuring two domains: communication and control, and care organization. In Addition, the survey has other items related to participants' demography like educational level, employment status, number of babies in this delivery, number of previous deliveries, and the type of delivery.

10.4.3. Participants, sample size, and settings

This national study was piloted in March 2017 in one hospital to overcome any potential challenges before including the remaining nine secondary care hospitals that are under the umbrella of the Ministry of Health, Oman. One hospital (H2) was excluded because this hospital had very few participants (only four). The nine hospitals were coded from H1-

H10 but H2 was dropped out. Thus, data presented in this chapter is confined to the nine governorate hospitals. The study was conducted from April-June 2017. The CCSS was given to all mothers who gave birth (whether vaginal delivery or caesarian section) for a period of 4 weeks. Patients who were admitted to the maternity wards for reason other than child delivery (e.g. pregnancy complications) were excluded from the study. Additionally, non-Arabic speaking mothers were excluded because they represent less than 1% of the total deliveries. Mothers who do not read Arabic were asked to get help from their attending relative (mother, husband, sister, etc.…). If they have no relative to help them in completing the survey, they were excluded from the study. Data from the pilot site were included in the data analysis.

10.4.4. Distribution

Questionnaires were given by the researcher to the head of quality departments in the participating hospitals who, in turn, handed it to the ward in-charge for distribution to mothers. A distribution plan was provided to all hospitals to ensure consistency of distribution and collection processes (Appendix 27). As detailed in the plan, the surveys were handed to the mothers on their date of discharge (usually 48-36 hours after admission) by the ward nurse.

10.4.5. Data entry

Data was entered in a pre-prepared Microsoft Excel sheet by a coordinator working with the researcher. She was trained on data entry and around 10% of the data entry was double checked by the researcher.

10.4.6. Data analysis

Two items, Q3 and Q6, were negatively worded and thus reverse coded. The seven points Likert scale of responses were from one to seven where one is strongly disagree and seven

is strongly agree. The scales were used to measure the mean score of satisfaction by adding up the scores given by each respondent for each question and dividing it by the number of respondents for that question. Similarly, the total satisfaction score is calculated by taking the average of scores for all survey items for each hospital. Participants are considered satisfied if the mean score was above the midpoint response (i.e. above 4.0). As there was an interest in all items in the survey, the satisfaction score is calculated for each item in the survey and not combined under their relevant factors that were identified by in the previous chapter.

Descriptive statistics for the responses were reported and visualised using the radar plots. One way Analysis of Variance (ANOVA) test and T-tests were was used to determine the statistical significance of differences in the mean satisfaction score between different categories. When ANOVA was significant, Bonferroni post hoc criterion was used identify the differences. Statistical significance was set at $p<0.05$. All data cleaning and analysis were conducted using Stata (StataCorp 2015).

To calculate the percentage of positive responses, these responses were regrouped into negative response (if score is 1, 2 or 3), positive response (if score is 5, 6, or 7)) and neutral response (if score is 4). Proportional (P) control charts were constructed to understand the variation of positive responses across the nine hospitals. The average percentage of positive response for each item in the survey was the central line of the chart. Similar to what has been discussed in chapter 7 (see page 111) , control chart selection and the equations used to plot the charts followed the guidelines by Provost and Murray (2011) as follows:

First: selection of SPC chart type

The data plotted is the percentage of positive satisfaction responses. Thus, according to the science of improvement, this data is considered as an attribute classification data (nonconforming) because data is classified into confirming (positive responses) and nonconforming (negative responses). Since the used data is in percentage of conforming, and based on Provost flow chart selection (see Figure 5.1), Proportional charts (P-Chart) was considered as the most appropriate type.

Second: constructing control charts

P-Control charts were constructed for each of the ten survey items. As detailed in previous chapters, constructing control charts involved three lines. The lines were constructed using the following equations as recommended by Provost for P charts with varying subgroup size.

- Central Line (CL) = mean = $\bar{P} = \frac{\sum p_i}{\sum n_i}$
- Standard Deviation = SD = $\sqrt{\left(\frac{\overline{P}(1-\overline{P})}{n_i}\right)}$
- Upper Control Limit = UCL = $\overline{P} + 3 * SD$
- Lower Control Limit = LCL = $\overline{P} - 3 * SD$

Where p_i = the number of positive response for each hospital for an item in the survey, n_i = the number of all responses (positive, negative, and neutral) for each hospital for that survey item. Control charts were constructed using Excel (2010).

10.4.7. Ethics, confidentiality, and anonymity

As detailed in the previous chapters, this study was ethically approved by both the University of Bradford and the Ministry of Health in Oman. An information sheet was provided in front of the questionnaire to explain the purpose and importance of the study. The information sheet also emphasizes that participation is voluntary and will not

negatively affect them in any way in the future. To ensure confidentiality and anonymity, participants were not asked to provide any information that can identify them like name, identification number, address, or mobile number.

10.5. Results

10.5.1. Respondent's characteristics and response rate

During the study period, there were 3566 women who gave birth in the participating hospitals. Out of the 3566 targeted population, 958 (26.9%) women participated in the study in the nine hospitals. The remaining women refused to participate, did not return the questionnaire or were not approached by the ward nurse especially during busy shifts. Response rate ranged from 18% (H4) to 79% (H5). See Table 10.1.

Out of the 958 participants, majority of respondents were not employed (67.0%), having primary to tertiary level of education (62.5%), did not have a chronic condition (87.7%), this delivery was not their first delivery (72.7%), had single baby (86.4%) through a vaginal delivery (70.0%), and this delivery was not their first delivery in the hospital (59.4%) (See Table 10.2).

Table 10.1: Response rate in the participating hospitals

	H1	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**	**Total**
Targeted population	116	297	360	38	675	549	577	721	233	3566
Completed questionnaires	76	84	65	30	139	162	131	169	102	958
Response rate (%)	65.5%	28.3%	18.1%**	78.9%*	20.6%	29.5%	22.7%	23.4%	43.8%	26.9%

:** Highest response, *:** Lowest response, **H2** excluded from the study

Table 10.2: Respondent's characteristics across hospitals

	H1 N (%)	**H3** N (%)	**H4** N (%)	**H5** N (%)	**H6** N (%)	**H7** N (%)	**H8** N (%)	**H9** N (%)	**H10** N (%)	**Total**
N (%)	**76**	**84**	**65**	**30**	**139**	**162**	**131**	**169**	**102**	**958**
Education level										
No education	1 (1.3)	1 (1.2)	0 (0.0)	2 (6.7)	2 (1.4)	1 (0.6)	4 (3.1)	2 (1.2)	5 (4.9)	18 (1.9)
Primary/secondary/tertiary education	46 (60.5)	54 (64.3)	39 (60.0)	23 (76.7)	79 (56.8)	105 (64.8)	83 (63.4)	102 (60.4)	68 (66.7)	599 (62.5)*
Graduate/Postgraduate	29 (38.2)	28 (33.3)	25 (38.5)	5 (16.7)	58 (41.7)	53 (32.7)	42 (32.1)	62 (36.7)	29 (28.4)	331 (34.6)
Missing	0 (0.0)	1 (1.2)	1 (1.5)	0 (0.0)	0 (0.0)	3 (1.9)	2 (1.5)	3 (1.8)	0 (0.0)	10 (1.0)
Employment status										
Employed	20 (26.3)	19 (22.6)	16 (24.6)	7 (23.3)	43 (30.9)	50 (30.9)	33 (25.2)	61 (36.1)	19 (18.6)	268 (28.0)
Not employed	55 (72.4)	59 (70.2)	46 (70.8)	23 (76.7)	94 (67.6)	94 (58.0)	93 (71.0)	99 (58.6)	79 (77.5)	642 (67.0)*
Retired	0 (0.0)	1 (1.2)	2 (3.1)	0 (0.0)	0 (0.0)	4 (2.5)	0 (0.0)	1 (0.6)	0 (0.0)	8 (0.8)
Missing	1 (1.3)	5 (6.0)	1 (1.5)	0 (0.0)	2 (1.4)	14 (8.6)	5 (3.8)	8 (4.7)	4 (3.9)	40 (4.2)
Do you Have a chronic condition?										
Yes	4 (5.3)	8 (9.5)	7 (10.8)	2 (6.7)	7 (5.0)	19 (11.7)	12 (9.2)	12 (7.1)	11 (10.8)	82 (8.6)
No	68 (89.5)	74 (88.1)	54 (83.1)	27 (90.0)	123 (88.5)	135 (83.3)	117 (89.3)	152 (89.9)	90 (88.2)	840 (87.7)*
Missing	4 (5.3)	2 (2.4)	4 (6.2)	1 (3.3)	9 (6.5)	8 (4.9)	2 (1.5)	5 (3.0)	1 (1.0)	36 (3.8)
Is this your first delivery?										
Yes	15 (19.7)	31(36.9)	16 (24.6)	7 (23.3)	42 (30.2)	38 (23.5)	27 (20.6)	30 (17.8)	27 (26.5)	233 (24.3)
No	59.(77.6)	50 (59.5)	44 (67.7)	21 (70.0)	96 (69.1)	113 (69.8)	104 (79.4)	136 (80.5)	73 (71.6)	696 (72.7)*
Missing	2(2.6)	3 (3.6)	5 (7.7)	2 (6.7)	1 (0.7)	11 (6.8)	0 (0.0)	3 (1.8)	2 (2.0)	29 (3.0)
Babies delivered this time										
Single baby	64 (84.2)	70 (83.3)	50 (76.9)	29 (96.7)	126 (90.7)	133 (82.1)	108 (82.4)	151 (89.4)	97 (95.1)	828 (86.4)*
Twins	1 (1.3)	1 (1.2)	2 (3.1)	0 (0.0)	3 (2.2)	3 (1.9)	2 (1.5)	4 (2.4)	2 (2.0)	18 (1.9)
triplets or more	8 (10.5)	9 (10.7)	6 (9.2)	1 (3.3)	7 (5.0)	13 (8.0)	16 (12.2)	9 (5.3)	3 (2.9)	72 (7.5)
Missing	3 (4.0)	4 (4.8)	7 (10.8)	0 (0.0)	3 (2.2)	13 (8.0)	5 (3.8)	5 (3.0)	0 (0.0)	40 (4.2)
Mode of delivery										
Vaginal	52 (68.4)	48 (57.1)	37 (56.9)	19 (63.3)	104 (74.8)	106 (65.4)	95 (72.5)	134 (79.3)	76 (74.5)	671 (70.0)*
Caesarean	22 (29.0)	34 (40.5)	19 (29.2)	11 (36.7)	34 (24.5)	40 (24.7)	34 (26.0)	34 (20.1)	26 (25.5)	254 (26.5)
Missing	2 (2.6)	2 (2.4)	9 (13.9)	0 (0.0)	1 (0.7)	16 (9.9)	2 (1.5)	1 (0.6)	0 (0.0)	33 (3.4)
Is this your first delivery in the hospital?										
Yes	27 (35.5)	46 (54.8)	25 (38.5)	8 (26.7)	56 (40.3)	64 (39.5)	48 (36.6)	52 (30.8)	37 (36.3)	363 (37.9)
No	45 (59.2)	37 (44.1)	35 (53.9)	21 (70.0)	81 (58.3)	90 (55.6)	82 (62.6)	113 (66.9)	65 (63.7)	569 (59.4)*
Missing	4 (5.3)	1 (1.2)	5 (7.7)	1 (3.3)	2 (1.4)	8 (4.9)	1 (0.8)	4 (2.4)	0 (0.0)	26 (2.7)

: Highest percentage in the category, **H2 excluded from the study*

10.5.2. Satisfaction score across hospitals

The overall satisfaction score for all hospitals was high (5.4). All hospitals had a satisfaction score above 5.0 except H8 where the total score was 4.7 (see Table 10.3 and the radar plot in Figure 10.1 (A)). All survey items had a satisfaction score above 5.0 except the negatively worded items, number three (*'how effectively were problems dealt with*) which scored 4.5 and six (*'how appropriate was the overall organization of care*') which scored 4.9. On the other hand, items with highest overall mean satisfaction scores (both scored 5.9) were item 2 *('the staff(s) responsible for my care were caring and compassionate'*) and item 10 *('I felt I was treated with respect at all times'*). See Table 10.3 and Figure 10.1 (B).

Figure 10.1: Radar plots showing: (A) mean satisfaction score by hosptials, (B) mean satisfactions score by survey items

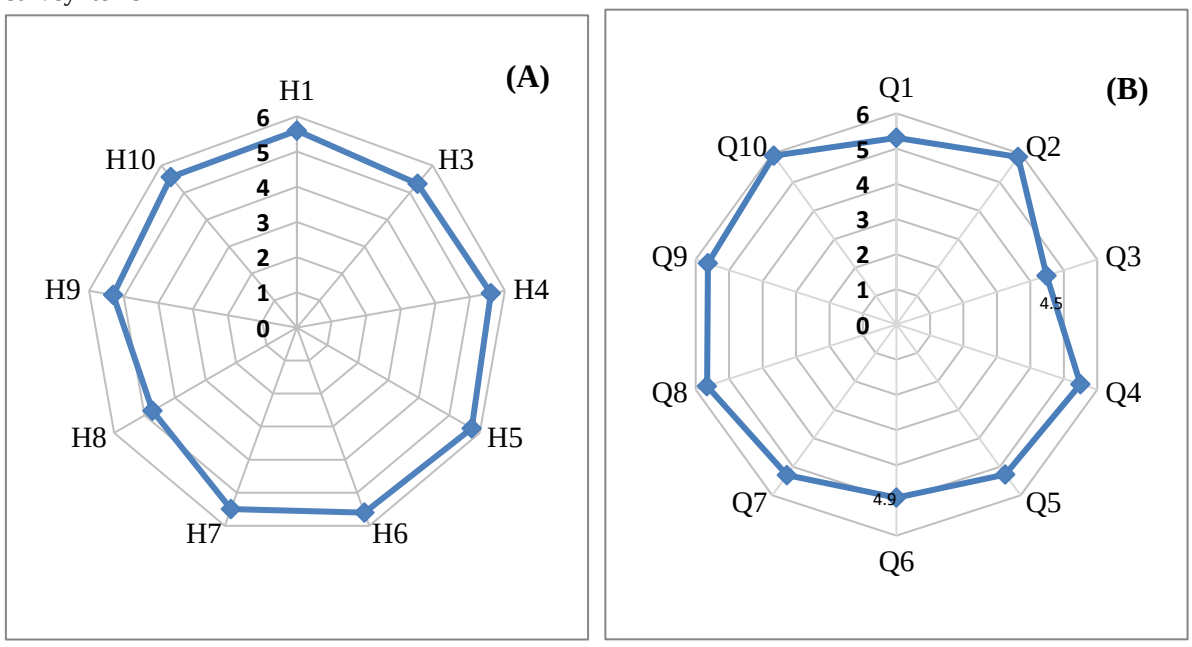

Table 10.3: Mean satisfaction score for all hospital by safety item

Questions		H 1	H 3	H 4	H 5	H 6	H 7	H 8	H 9	H10	All Hospitals
All Q1 – Q10	N.	729	797	600	289	1341	1542	1214	1635	1010	9157
	Mean (SD)	5.6 (2.0)	5.3 (2.1)	5.6 (1.8)	5.7 (2.0)	5.6 (1.9)	5.5 (1.7)	4.7 (2.3)*	5.3 (1.8)	5.6 (1.9)	5.4 (2.0)
Q1: I felt that I had adequate control over my care	N.	71	81	59	29	134	156	119	161	102	912
	Mean (SD)	5.5 (1.9)	5.4 (1.8)	5.5 (1.7)	5.6 (1.9)	5.6 (1.6)	5.3 (1.6)	4.5 (2.3)	5.4 (1.5)	5.4 (1.7)	5.3 (1.8)
Q2: The staff(s) responsible for my care were caring and compassionate	N.	76	83	60	30	138	158	126	166	102	939
	Mean (SD)	6.2 (1.6)	5.9 (1.7)	6.1 (1.6)	6.6 (0.7)	6.2 (1.3)	5.8 (1.5)	5.1 (2.2)	5.8 (1.5)	6.1 (1.5)	5.9 (1.6)**
Q3: Problems arose were not dealt with effectively	N.	73	79	57	29	133	154	120	160	101	906
	Mean (SD)	4.8 (2.4)	4.3 (2.4)	4.5 (2.1)	4.7 (2.5)	4.2 (2.5)	4.8 (2.2)	4.1 (2.4)	4.5 (2.2)	4.6 (2.5)	4.5 (2.4)*
Q4: My needs have been addressed with appropriate consideration for my time	N.	71	77	60	29	135	153	121	165	99	910
	Mean (SD)	5.9 (1.6)	5.6 (1.8)	5.6 (1.5)	6.2 (1.4)	5.7 (1.7)	5.4 (1.8)	4.7 (2.2)	5.3 (1.8)	5.9 (1.6)	5.5 (1.8)
Q5: I felt involved in the procedures related to my care	N.	69	77	58	27	128	149	114	163	100	885
	Mean (SD)	5.4 (1.9)	5.0 (2.2)	5.9 (1.6)	5.7 (2.0)	5.6 (1.7)	5.2 (1.7)	4.8 (2.2)	5.1 (1.8)	5.5 (2.0)	5.3 (1.9)
Q6: The overall organization of my care has not been appropriate	N.	74	79	59	29	135	151	121	163	100	911
	Mean (SD)	4.9 (2.4)	4.6 (2.3)	5.4 (2.1)	4.6 (2.6)	5.0 (2.4)	5.3 (1.9)	4.3 (2.4)	5.0 (2.1)	5.0 (2.3)	4.9 (2.3)*
Q7: I would choose the same type of care for my next pregnancy	N.	73	81	61	28	134	151	120	162	101	911
	Mean (SD)	5.6 (1.9)	5.3 (2.2)	5.3 (1.9)	5.2 (2.3)	5.5 (2.0)	5.5 (1.8)	4.7 (2.3)	5.1 (1.9)	5.6 (1.9)	5.3 (2.0)
Q8: I felt safe at all times	N.	74	78	61	29	134	157	124	165	101	923
	Mean (SD)	5.9 (1.9)	5.7 (1.9)	5.7 (1.8)	6.0 (1.7)	6.0 (1.5)	5.8 (1.4)	4.8 (2.3)	5.5 (1.7)	5.9 (1.7)	5.7 (1.8)
Q9: I felt well informed due to good communication	N.	75	80	63	29	135	154	122	165	102	925
	Mean (SD)	5.5 (2.2)	5.5 (1.8)	5.8 (1.6)	6.3 (1.6)	5.9 (1.5)	5.7 (1.5)	5.0 (2.1)	5.5 (1.6)	5.9 (1.6)	5.6 (1.7)
Q10: I felt I was treated with respect at all times	N.	73	82	62	30	135	159	127	165	102	935
	Mean (SD)	6.2 (1.7)	6.1 (1.6)	6.3 (1.4)	6.4 (1.3)	6.3 (1.3)	6.0 (1.5)	5.3 (2.1)	5.6 (1.8)	5.9 (1.6)	5.9 (1.7)**

*****:** Items with highest satisfaction score, ***:** The lowest overall satisfaction score, **SD:** Standards Deviation, H2 data excluded from the study,* **H2** *excluded from this study*

10.5.3. Percentage of positive responses

Percentage of positive responses (scores 5, 6, or 7) by survey items is represented in Table 10.4. Overall, 69% of participants had a positive response about childbearing services. Items number 2 and 10 had the highest percentage of positive responses 80% and 79.5% respectively. In contrast, items 2 and 6 had the lowest percentages with 52.1% and 56.9 respectively. The variation of positive responses across hospital by survey items is graphically presented in P-charts in Figure 10.2. It can be clearly seen that the percentage of positive responses for all safety items exhibited special cause variation where H6, H7 and H10 were above the control limits while H8 and H9 was below the limits. However, this picture is different when each survey items were examined individually. It is clear that H8 had a percentage below the LCL in all the survey items except in item 3 and 6 where variation was due to chance.

Table 10.4: Percentage of responses (positive/negative/neutral) by safety items

		H1 N (%)	H3 N (%)	H4 N (%)	H5 N (%)	H6 N (%)	H7 N (%)	H8 N (%)	H9 N (%)	H10 N (%)	Total
		760	840	650	300	1390	1620	1310	1690	1020	9580
All items	Agree	564 (74.2)	574 (68.3)	462 (71.1)	230 (76.7)	1047 (75.3)	1193 (73.6)	709 (54.1)	1089 (64.4)	770 (75.5)	6638 (69.3)
	Neutral	36 (4.7)	59 (7.0)	53 (8.2)	14 (4.7)	87 (6.3)	131 (8.1)	107 (8.2)	219 (13.0)	69 (6.8)	775 (8.1)
	Disagree	129 (17.0)	164 (19.5)	85 (13.1)	45 (15.0)	207 (14.9)	218 (13.5)	398 (30.4)	327 (19.4)	171 (16.8)	1744 (18.2)
	Missing	31 (4.1)	43 (5.1)	50 (7.7)	11 (3.7)	49 (3.5)	78 (4.8)	96 (7.3)	55 (3.3)	10 (1.0)	423 (4.4)
Q.1	Agree	53 (69.7)	62 (73.8)	43 (66.2)	21 (70.0)	104 (74.8)	112 (69.1)	61 (46.6)	112 (66.3)	70 (68.6)	638 (66.6)
	Neutral	8 (10.5)	7 (8.3)	6 (9.2)	5 (16.7)	15 (10.8)	19 (11.7)	15 (11.5)	32 (18.9)	16 (15.7)	123 (12.8)
	Disagree	10 (13.2)	12 (14.3)	10 (15.4)	3 (10.0)	15 (10.8)	25 (15.4)	43 (32.8)	17 (10.1)	16 (15.7)	151 (15.8)
	Missing	5 (6.6)	3 (3.6)	6 (9.2)	1 (3.3)	5 (3.6)	6 (3.7)	12 (9.2)	8 (4.7)	0 (0.0)	46 (4.8)
Q.2	Agree	68 (89.5)	68 (81.0)	51 (78.5)	29 (96.7)	124 (89.2)	134 (82.7)	84 (64.1)	120 (71.0)	88 (86.3)	766 (80.0)
	Neutral	2 (2.6)	4 (4.8)	4 (6.2)	1 (3.3)	5 (3.6)	12 (7.4)	6 (4.6)	28 (16.6)	7 (6.9)	69 (7.2)
	Disagree	6 (7.9)	11 (13.1)	5 (7.7)	0 (0.0)	9 (6.5)	12 (7.4)	36 (27.5)	18 (10.7)	7 (6.9)	104 (10.9)
	Missing	0 (0.0)	1 (1.2)	5 (7.7)	0 (0.0)	1 (0.7)	4 (2.5)	5 (3.8)	3 (1.8)	0 (0.0)	19 (2.0)
Q.3	Agree	44 (57.9)	44 (52.4)	29 (44.6)	16 (53.3)	67 (48.2)	100 (61.7)	57 (43.5)	86 (50.9)	56 (54.9)	499 (52.1)
	Neutral	4 (5.3)	2 (2.4)	10 (15.4)	2 (6.7)	8 (5.8)	11 (6.8)	9 (6.9)	22 (13.0)	6 (5.9)	74 (7.7)
	Disagree	25 (32.9)	33 (39.3)	18 (27.7)	11 (36.7)	58 (41.7)	43 (26.5)	54 (41.2)	52 (30.8)	39 (38.2)	333 (34.8)
	Missing	3 (4.0)	5 (6.0)	8 (12.3)	1 (3.3)	6 (4.3)	8 (4.9)	11 (8.4)	9 (5.3)	1 (1.0)	52 (5.4)
Q.4	Agree	61 (80.3)	61 (72.6)	48 (73.9)	27 (90.0)	112 (80.6)	119 (73.5)	67 (51.2)	109 (64.5)	84 (82.4)	688 (71.8)
	Neutral	3 (4.0)	6 (7.1)	5 (7.7)	1 (3.3)	8 (5.8)	10 (6.2)	19 (14.5)	22 (13.0)	4 (3.9)	78 (8.1)
	Disagree	7 (9.2)	10 (11.9)	7 (10.8)	1 (3.3)	15 (10.8)	24 (14.8)	35 (26.7)	34 (20.1)	11 (10.8)	144 (15.0)
	Missing	5 (6.6)	7 (8.3)	5 (7.7)	1 (3.3)	4 (2.9)	9 (5.6)	10 (7.6)	4 (2.4)	3 (2.9)	48 (5.0)
Q.5	Agree	51 (67.1)	49 (58.3)	49 (75.4)	21 (70.0)	102 (73.4)	114 (70.4)	66 (50.4)	109 (64.5)	78 (76.5)	639 (66.7)
	Neutral	6 (7.9)	9 (10.7)	5 (7.7)	1 (3.3)	9 (6.5)	14 (8.6)	13 (9.9)	16 (9.5)	4 (3.9)	77 (8.0)
	Disagree	12 (15.8)	19 (22.6)	4 (6.2)	5 (16.7)	17 (12.2)	21 (13.0)	35 (26.7)	38 (22.5)	18 (17.7)	169 (17.6)
	Missing	7 (9.2)	7 (8.3)	7 (10.8)	3 (10.0)	11 (7.9)	13 (8.0)	17 (13.0)	6 (3.6)	2 (2.0)	73 (7.6)
Q.6	Agree	48 (63.2)	43 (51.2)	43 (66.2)	16 (53.3)	87 (62.6)	104 (64.2)	64 (48.9)	104 (61.5)	62 (60.8)	571 (59.6)

	Neutral	1 (1.3)	10 (11.9)	3 (4.6)	1 (3.3)	7 (5.0)	11 (6.8)	6 (4.6)	25 (14.8)	8 (7.8)	72 (7.5)
	Disagree	25 (32.9)	26 (31.0)	13 (20.0)	12 (40.0)	41 (29.5)	36 (22.2)	51 (38.9)	34 (20.1)	30 (29.4)	268 (28.0)
	Missing	2 (2.6)	5 (6.0)	6 (9.2)	1 (3.3)	4 (2.9)	11 (6.8)	10 (7.6)	6 (3.6)	2 (2.0)	47 (4.9)
Q.7	Agree	55 (72.4)	57 (67.9)	44 (67.7)	21 (70.0)	99 (71.2)	117 (72.2)	67 (51.2)	102 (60.4)	78 (76.5)	640 (66.8)
	Neutral	7 (9.2)	5 (6.0)	7 (10.8)	0 (0.0)	12 (8.6)	13 (8.0)	14 (10.7)	16 (9.5)	6 (5.9)	80 (8.4)
	Disagree	11 (14.5)	19 (22.6)	10 (15.4)	7 (23.3)	23 (16.6)	21 (13.0)	39 (29.8)	44 (26.0)	17 (16.7)	191 (19.9)
	Missing	3 (4.0)	3 (3.6)	4 (6.2)	2 (6.7)	5 (3.6)	11 (6.8)	11 (8.4)	7 (4.1)	1 (1.0)	47 (4.9)
Q.8	Agree	63 (82.9)	61 (72.6)	48 (73.9)	25 (83.3)	117 (84.2)	130 (80.3)	76 (58.0)	115 (68.1)	85 (83.3)	720 (75.2)
	Neutral	1 (1.3)	4 (4.8)	5 (7.7)	1 (3.3)	7 (5.0)	15 (9.3)	7 (5.3)	24 (14.2)	6 (5.9)	70 (7.3)
	Disagree	10 (13.2)	13 (15.5)	8 (12.3)	3 (10.0)	10 (7.2)	12 (7.4)	41 (31.3)	26 (15.4)	10 (9.8)	133 (13.9)
	Missing	2 (2.6)	6 (7.1)	4 (6.2)	1 (3.3)	5 (3.6)	5 (3.1)	7 (5.3)	4 (2.4)	1 (1.0)	35 (3.7)
Q.9	Agree	56 (73.7)	57 (67.9)	51 (78.5)	27 (90.0)	115 (82.7)	128 (79.0)	80 (61.1)	114 (67.5)	87 (85.3)	715 (74.6)
	Neutral	3 (4.0)	10 (11.9)	6 (9.2)	0 (0.0)	8 (5.8)	13 (8.0)	6 (4.6)	21 (12.4)	4 (3.9)	71 (7.4)
	Disagree	16 (21.1)	13 (15.5)	6 (9.2)	2 (6.7)	12 (8.6)	13 (8.0)	36 (27.5)	30 (17.8)	11 (10.8)	139 (14.5)
	Missing	1 (1.3)	4 (4.8)	2 (3.1)	1 (3.3)	4 (2.9)	8 (4.9)	9 (6.9)	4 (2.4)	0 (0.0)	33 (3.4)
Q.10	Agree	65 (85.5)	72 (85.7)	56 (86.2)	27 (90.0)	120 (86.3)	135 (83.3)	87 (66.4)	118 (69.8)	82 (80.4)	762 (79.5)
	Neutral	1 (1.3)	2 (2.4)	2 (3.1)	2 (6.7)	8 (5.8)	13 (8.0)	12 (9.2)	13 (7.7)	8 (7.8)	61 (6.4)
	Disagree	7 (9.2)	8 (9.5)	4 (6.2)	1 (3.3)	7 (5.0)	11 (6.8)	28 (21.4)	34 (20.1)	12 (11.8)	112 (11.7)
	Missing	3 (4.0)	2 (2.4)	3 (4.6)	0 (0.0)	4 (2.9)	3 (1.9)	4 (3.1)	4 (2.4)	0 (0.0)	23 (2.4)

H2 *excluded from this study*

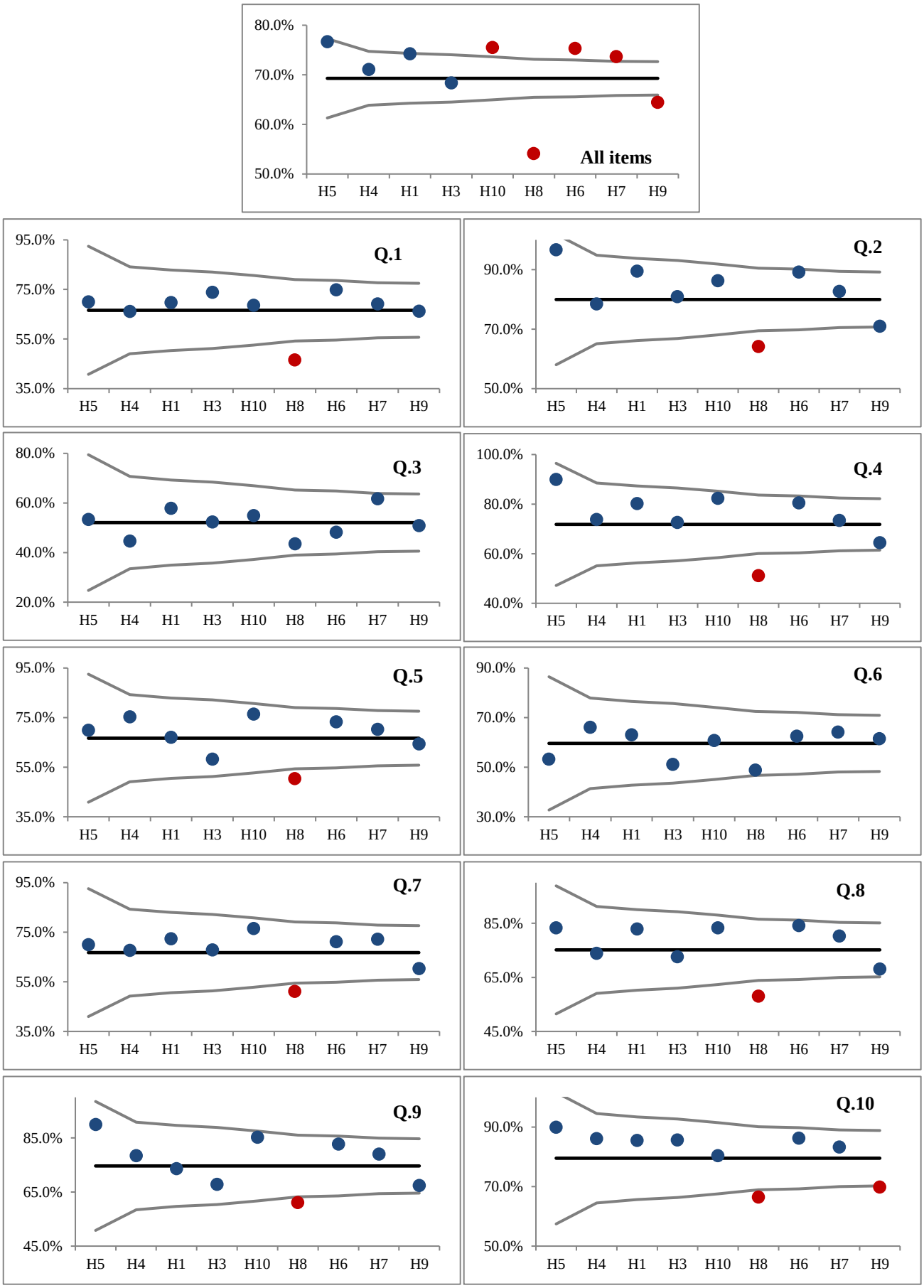

Figure 10.2: P chart of % of positive response across hospitals by survey items (Q1 – Q10). **Red dots:** percentages outside the control limits, H2 data excluded in this study

10.5.4. Factors affecting mothers' satisfaction

Table 10.5 shows the overall mean satisfaction score by a number of factors. The mean satisfaction score was significantly higher (t=2.10, p=0.04) among those who had vaginal delivery (5.42) compared with caesarian delivery (5.32). Additionally, satisfaction was significantly higher (t=6.28, p=<0.001) among women who had a previous delivery (5.47) compared with first delivery women (5.17). Furthermore, women who had delivered in the hospital previously (5.45) were significantly more satisfied (t=2.98, p=0.002) than those who delivered in that hospital for the first time (5.42). However, no significant difference was observed between women who had an underlying chronic condition and those who don't (p=0.79).

An analysis of variance shows that there is a significant difference in the overall satisfaction score across the different categories of level of education, employment status, and number of babies delivered (F values= 14.0, 14.02, 13.97 respectively, p=<0.001). Post hoc analyses using the Bonferroni post hoc criterion for significance was conducted for these three factors. In relation to the level of education, participants with primary/secondary/tertiary education (5.20) were significantly (p=<0.001) more satisfied compared with graduate/post graduate education (4.96). Similarly, non-employed participants (5.18) had a significantly higher score (p=<0.001) than employed women (4.91). Furthermore, women who had triple or more babies in their delivery (5.50) had a significantly higher (p=<0.001) satisfaction score compared with women who had a single baby (5.08).

Table 10.5: satisfaction score in relation to participants' characteristics

		Mean (SD)	N	T/F value	p value
Mode of delivery	Caesarean	5.32 (1.9)	2445	2.1012*	0.0357
	Vaginal	5.42 (2.0)	6414		
First delivery	No	5.47 (1.9)	6663	6.2849*	<0.001
	Yes	5.17 (2.0)	2237		
Chronic condition	No	5.40 (1.9)	8044	0.2621*	0.7933
	Yes	5.42 (1.9)	790		
First time in the hospital	No	5.45 (2.0)	5456	2.9801*	0.0029
	Yes	5.32 (1.9)	3462		
Education	Graduate/Postgraduate	4.96 (2.1)	3243	14.0**	<0.001
	No education	5.10 (2.1)	168		
	Primary/secondary/tertiary	5.20 (2.2)	5667		
Employment status	Employed	4.91 (2.1)	2623	14.02**	<0.001
	Not employed	5.18 (2.1)	6087		
	Retired	5.25 (1.9)	79		
Babies delivered	Single baby	5.08 (2.1)	7960	13.97**	<0.001
	Triplets or more	5.50 (2.0)	657		
	Twins	5.43 (2.0)	167		

**: t-test value, **: ANOVA F value, SD: Standard Deviation*

10.6. Discussion

In this study, maternal satisfaction with childbirth services was examined using the validated CCSS in nine maternity units in Oman. It was found that the baseline maternal satisfaction is high (above 4.0) in all the nine hospitals. Control charts showed that the percentage of positive responses varied across the nine hospitals. This variation was within the limits except for one hospital (H8) representing special cause variation. As this is a quantitative study, it was not possible to examine if the special variation is related to the quality of care provided by the hospitals. Future studies should be conducted to investigate this variation and can use the pyramid model developed by Mohammed et al. (2005) as a guide (see chapter 5 Figure 5.3).

Additionally, satisfaction is significantly higher among women who had vaginal delivery, had previous delivery and delivered previously in the same hospitals. Furthermore, non-educated, non-employed and women who had triplet or more babies were more satisfied compared with employed, have graduate education or had single baby on delivery.

As this the first national study in Oman, results could not be compared with a previous study in the country. However, the study by Ghobashi and Khandekar (2008), although confined to one region in Oman, found that women are very satisfied with antenatal services. High maternal satisfaction has been reported by many studies and could be explained by the positive perception of women after a positive outcomes (having a healthy baby) (Srivastava et al. 2015) or by the gratitude bias especially in a publicly funded services (van Teijlingen et al. 2003). On the other hand, however, the high satisfaction level might be explained by the high quality services as reported by by the United Nations Children's Fund (Aty et al. 2014). Despite the high satisfaction level, further improvement can be made by focusing on areas with least satisfaction i.e. response to problems encountered by women and the overall organization of care. This may require future qualitative studies to examine how best these areas could be improved.

The association between mode of delivery and maternal satisfaction is not very clear. While Geary et al. (1997) and Guittier et al. (2014) reported that women were more satisfied after a vaginal delivery, Spaich et al. (2013) reported no association between mode of delivery and satisfaction. In this study, satisfaction was significantly higher among women after vaginal delivery compared to caesarean delivery. In Oman, women prefer vaginal delivery as they believe that caesarean section may limit the number of babies that they can deliver (Mathew et al. 2002). This attitude may explain the higher

satisfaction among women who had vaginal delivery since they have got what they prefer or expect.

Although the evidence is equivocal, the higher satisfaction among women who have experienced childbirth previously and those who have had a previous childbirth in the same hospital is in line with the theory of planned Behaviour. The theory implies that multiparous women and having a previous delivery in that hospital would have different expectations because they had a previous experience (Ayers and Pickering 2005). That is to say, women who know what to expect during childbirth will be more satisfied. Birth plans (preparedness plan) given during pregnancy may improve women's experience especially for women with first delivery (World Health Organization 2006; Kaur et al. 2009). Thus, future studies need to study the current orientation plans and how can this be improved.

The association between satisfaction and women's underlying condition is not widely examined. Most studies examine the association between satisfaction and the women's health condition after delivery (Srivastava et al. 2015; Jha et al. 2017). Surprisingly, no association was found between satisfaction and women's underlying heath condition. Future studies may need to examine this area to identify if this is a constant finding.

Similar to this research findings, Bélanger-Lévesque et al. (2014) found that less educated women were more satisfied with delivery services. Furthermore, Kabakian-Khasholian et al. (2017) conducted a large scale study in three Arab countries and found that higher satisfaction score was associated with less educated women. Although De Santis et al. (2018) found an opposite finding, they emphasized that meeting the needs of the educated women could explain the higher satisfaction among the more educated compared with the less educated. Although other studies found that employed women were more satisfied

than non-employed (opposite to findings of this research), it can be seen that women with different educational level and employment stats have different perception about quality of care and therefore, have different needs. Thus, future studies need to examine the needs of each group and plans to be made on how best these needs can be met.

10.7. Conclusion

Women's satisfaction about Omani MoH's maternal services is high. The two items that had least satisfaction score were: response to problems encountered by women and the overall organizations. One hospital (H8) had a positive percentage below the control limits in all of the survey items except one. Higher satisfaction scores were observed by women who (1) had vaginal delivery, (2) had previous delivery, (3) delivered previously in the same hospital, (4) are not educated, (5) are not employed, and (6) had triplet baby or more. Future qualitative studies are needed to (1) examine how best these two survey items with lowest scores can be improved, (2) investigate the special cause variation seen in the percentage of positive responses, and (3) understand the different needs of each group of women and how best to meet these needs.

Chapter 11

Examining trends and variation in caesarean section rates over time and between maternity units in Oman

11. Chapter eleven: Examining trends and variation in caesarean section rates over time and between maternity units in Oman

11.1. Abstract

Caesarean Section (CS) is a very common procedure that might be lifesaving but can cause harmful consequences especially if conducted when there is no clinical indication. As it is the case in many countries, the rate of CS in Oman has been increasing over the last few decades. However, the trend and variation in CS rates across Governorate hospitals have not been studied previously.

Using publicly available data, this paper examined trends and variation in CS over time and between nine maternity units in Oman. Run charts were used to examine the trend of CS rate for all the nine maternity units over 17 years period (2000-2017). Statistical process control charts were used to compare CS rates between the nine units using 2017 data.

It was found that the CS rate has increased from 10% in 2000 and reached to 21% in 2017 and all the hospitals had rates above the WHO accepted rate of 15%. Additionally, the emergency CS (13%) rate was higher than the elective CS (4%) but both rates have been increasing throughout the 17 years period. Using p-control chart, the variation in CS across the nine maternity units exhibited a special-cause pattern where six hospitals (H1, H4, H5, H6, H7, and H9) lied outside the control limits.

In conclusion, CS rate in governorate hospitals of Oman is increasing and is above the WHO recommended rate in all the hospitals. Additionally, these rates varied across hospitals and p-chart showed that this variation is a special cause variation. Future studies need to examine the indications for CS and the reasons for variation.

11.2. Introduction

Measuring quality of maternal care is a prerequisite for any improvement initiative (Sinni et al. 2016). However, selecting the best indicators to monitor quality of maternity care might be challenging (Collins and Draycott 2015). Escuriet et al. (2015) systematically reviewed the most commonly used indicators that are internationally used to monitor quality of care in maternity units. Their review came up with the top ten indicators. The most commonly used indicator was the rate of caesarean section (CS) followed by the type of instrument used (vaginal delivery).

Worldwide, CS is the most frequently performed surgical operation (Souza et al. 2016). Like any other surgery, it can be lifesaving but can be associated with increased health risks such as anaesthesia related complications, surgical infection and organ damage (Betrán et al. 2014). The risks associated with CS as well as the increasing cost of the operation attracted the attention for monitoring and maintaining an appropriate rate of CS. At the population level, caesarean section was associated with decreased maternal and neonatal mortality but caesarean section rates above 10-15% may not have additional gains and can cause more harm than benefit (Ye et al. 2016). The recommended population-based caesarean section rate cannot be used as a reference for hospital/institutions because of differences in case mix (Souza et al. 2016). A number of characteristics should be considered when calculating the risk-adjusted rate like the complexity of hospital (high, medium, low), type of hospital (public, social security, private), number of maternity beds, teaching status and the financial incentives for the hospital and staff to CS compared with vaginal delivery (Taljaard et al. 2009). The Robson classification (10 criteria) is considered by the WHO to be the most appropriate system that can be used to compare CS rates across different institutions because it takes into account the characteristics of the population served by each institution (Betrán et al.

2016). The optimal CS rate has been debated and will probably continue to be so in the years to come. Patient's preference, changes in demographical picture and doctor's preference when faced with complicated vaginal deliveries have all contributed to the increasing rates worldwide (Robson and de Costa 2017).

As many other countries, the CS rate in Oman has been increasing in the last decades. According to Jurdi and Khawaja (2004), the population-based CS rate in 1995 was 6.7. In 2009 and 2010, the population based CS rates were 14.9 and 17.3 respectively (World Health Organization 2016). As far as the researcher is aware, there is no published paper that discusses the trend of CS rate over time and across hospitals in Oman. This paper examines the prevalence and trend of CS in maternity units in Oman Governorate hospitals in Oman over the last 17 years (from 2000 to 2017) and compares the variation between units using statistical process control charts.

11.3. Method

11.3.1. Setting

The prevalence of institutional based CS in this study is examined in nine out of 10 Governorate hospitals in Oman. One hospital (H2) was excluded because this hospital serves only 45,156 representing only 1% of the population and does not perform any CS (MoH 2017). The nine hospitals were coded from H1-H10 but H2 was dropped out. The hospitals included in the study provide services in different specialities like surgical, medical, and maternal as well as other subspecialties like ophthalmology, Ear nose and throat, and dental. The bed capacity in the included hospitals varied from 102 to 510. In relation to maternity, Table 11.1 shows the number of beds, occupancy rates, length of stay and number of visits in each of the nine hospitals included in the study. The bed number ranged from 12 to 86 while the bed occupancy rate ranged from 36% to 96%. The

length of stay ranged from 1.4 to 2.1 days. The number of visits to maternity clinics ranged from 5374 to 14815 visits per year (MoH 2017).

Table 11.1: Maternity related statistics by governorate hospital

	H1	**H3**	**H4**	**H5**	**H6**	**H7**	**H8**	**H9**	**H10**
Number of all beds	150	191	240	102	305	236	510	375	229
Maternity beds	29	28	52	12	60	51	86	72	57
Maternity Bed Occupancy rate (%)	58	96	75	36	81	91	68	94	53
Maternity bed length of stay (day)	2	1.8	2.1	1.7	1.4	1.7	1.6	2.1	2.1
Maternity clinic visits	5374	8468	11054	NA	14815	1793	6085	9793	9650

NA: *Not available,* **H2** *excluded from this study*

11.3.2. Data sources

The data used for this study was collected from the annual health reports published yearly by the Omani Ministry of Health and is available online. In this report, four data related to CS are available and presented as follows: the number of elective CS, the number emergency CS, the percentage of CS out of total deliveries and percentage of elective CS out of CS.

11.3.3. Run chart and Statistical process Control chart

As explained by Perla et al. (2011), run chart graphically present a set of data in some sort of order. Using a number of rules, run charts are used to determine the presence or absence of any non-random pattern and if the changes introduced have made any improvement. In run charts, the concept or quality indicator being measured (e.g. mortality rate, caesarean section rate) is represented in the vertical axis while the order of occurrence (mostly in a time scale e.g. days, weeks, or months) is represented in the horizontal axis. A median line is frequently drawn as a centreline in a run chart. Although run chart is a useful analytical tool to understand process performance, it cannot be used to assess the process stability. Process stability can be assessed by using statistical process control charts described below.

As explained in previous chapters, control charts are the graphical representation of statistical process control theory. The theory differentiates between two types of

variations. Common cause variation is intrinsic to every process operating under stable conditions. On the other hand, special cause variation arises from unusual circumstances extrinsic to the process. Control chart typically has three lines. A central line which is the mean, an upper control limit (UCL) and a Lower Control Limit (LCL). The UCL and LCL are drawn three Standard Deviations away from the mean. If data lie within the control limits (without any unusual patterns) then the process is consistent with common cause variation and is termed to be stable or in-control. If, however, the data lie outside the limits or have a particular pattern, then the process is consistent with special cause variation and is termed to be unstable or out of control (Mohammed et al. 2008).

11.3.4. Data analysis

In this paper, the rate of all CS (elective and emergency) is calculated by dividing the number of CS over the number of total birth deliveries. Similarly, the number of elective and emergency CS is divided by the number of all deliveries to get the rate of elective and emergency CS. Proportional (P) control charts were constructed to understand the variation in caesarean section rates across the nine hospitals. The average rate of CS was the central line of the chart. Similar to what has been discussed in chapter 7 (see page 111) , chart selection and the equations used to plot the charts followed the guidelines by Provost and Murray (2011).

Run charts were plotted on a yearly scale for 17 years period from 2000 to 2017 (the latest available data at the time of writing this chapter). However, p-charts were developed using the most recent data (2017 data) so that future improvement efforts can be best guided as opposed to using 17 years data.

Descriptive statistics were used in this paper. All data cleaning and management were done using Stata (StataCorp 2015). Control charts were constructed using Excel (2010).

11.3.5. Ethical approval

As detailed in the previous chapters, this study was ethically approved by both the University of Bradford and the Ministry of Health in Oman.

11.4. Results

11.4.1. Rate of all C/S since 2000

Figure 11.1 is a run chart showing the trend of all CS, emergency CS and elective CS in all the nine hospitals from 2000 to 2017. It can be seen that CS rate has increased from 10% in 2000 to 18% in 2010 and peaked to 22% in 2015 before observing a slight decrease in 2016 and 2017 with rates 21.8% and 21.6% respectively. Additionally, it is clear that the overall average rate of emergency CS (13%) is higher than the elective CS (4%) rate but both rates have been increasing throughout the 17 years period. However, slight drop can be observed in emergency CS in 2016 and 2017.

Figure 11.2 shows the individual hospital CS rate over the last 17 years in comparison with national average hospital rate. Six hospitals (H1, H3, H5, H6, H8 and H10) had an individual mean rate above the average national rate and the remaining hospitals' means were below the national rate. It can be seen that the CS rate in H3, H6, H8 and H9 have similar trend with national average rate. However, H1 has a CS rate that has always been below the average national rate while H3 has a rate that has always been below the national rate. The rate in H5 had an abnormal behaviour since 2010 with a sharp increase from around 12% in 2010 to more than 22% in 2012 and 31% in 2015. Similarly, CS rate in H10 was above the national rate until 2012 when it started to have a similar behaviour with the national rate.

11.4.2. Rate of emergency CS since 2000

Figure 11.3 shows the run charts of emergency CS rates for individual hospitals from 2000 to 2017. The pattern of emergency CS rate in H3, H6, H7, H8, and H9 is similar

with the national rate while H1 and has always been above the average rate and H4 always been below the national rate. The rate of emergency CS in H5 had no specific pattern with sharp increase and sharp drop in 2010 and 2015 respectively.

11.4.3. Rate of elective C/S since 2000

Figure 11.4 shows the trend of individual rate of elective CS from 2000 to 2017 compared with the national average rate. It can be seen that the national elective CS rate has been steadily increasing throughout this period. The elective rate in H3, H4, and H5 had similar pattern with the national rate. However, this rate in H6 and H8 had always been above the national rate while H7 and H8 had always been below the national rate. Non-consistent pattern can be observed with H10.

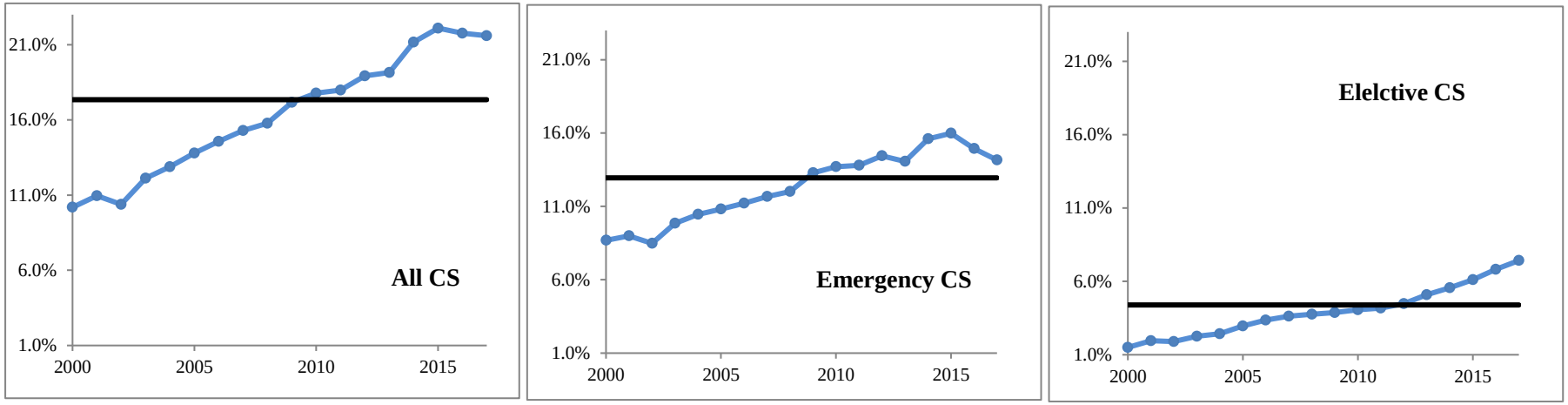

Figure 11.1: Trend of all, emergency and elective CS (2000-2017) for nine governorate hospitals. **Solid line:** Average rate

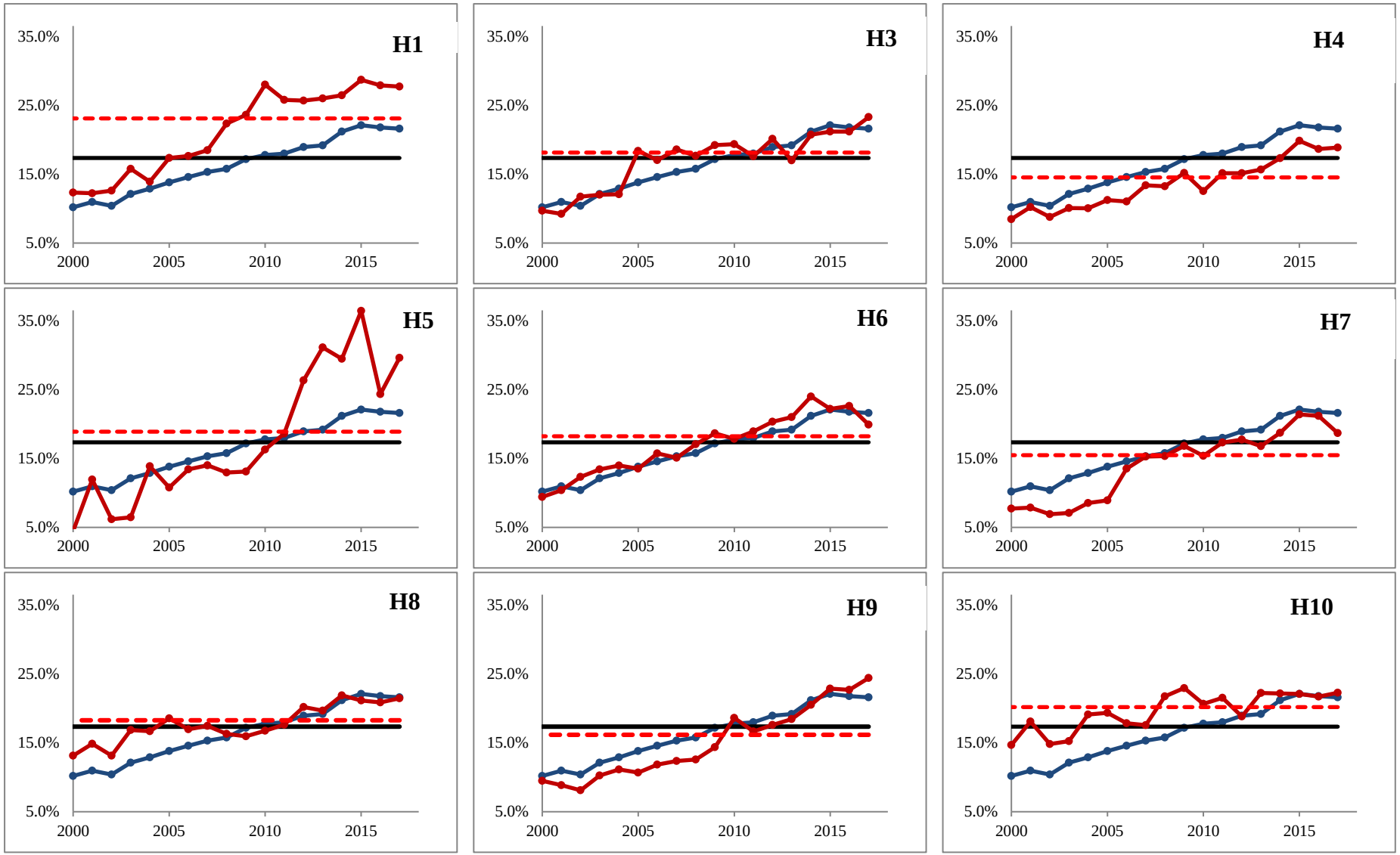

Figure 11.2: Rate of **All** caesarean sections from 2000-2017 for H1-H10. **Blue line:** overall rate, **dark solid line:** Overall mean rate, **Red line:** individual hospital rate, dotted **red line:** individual hospital mean rate

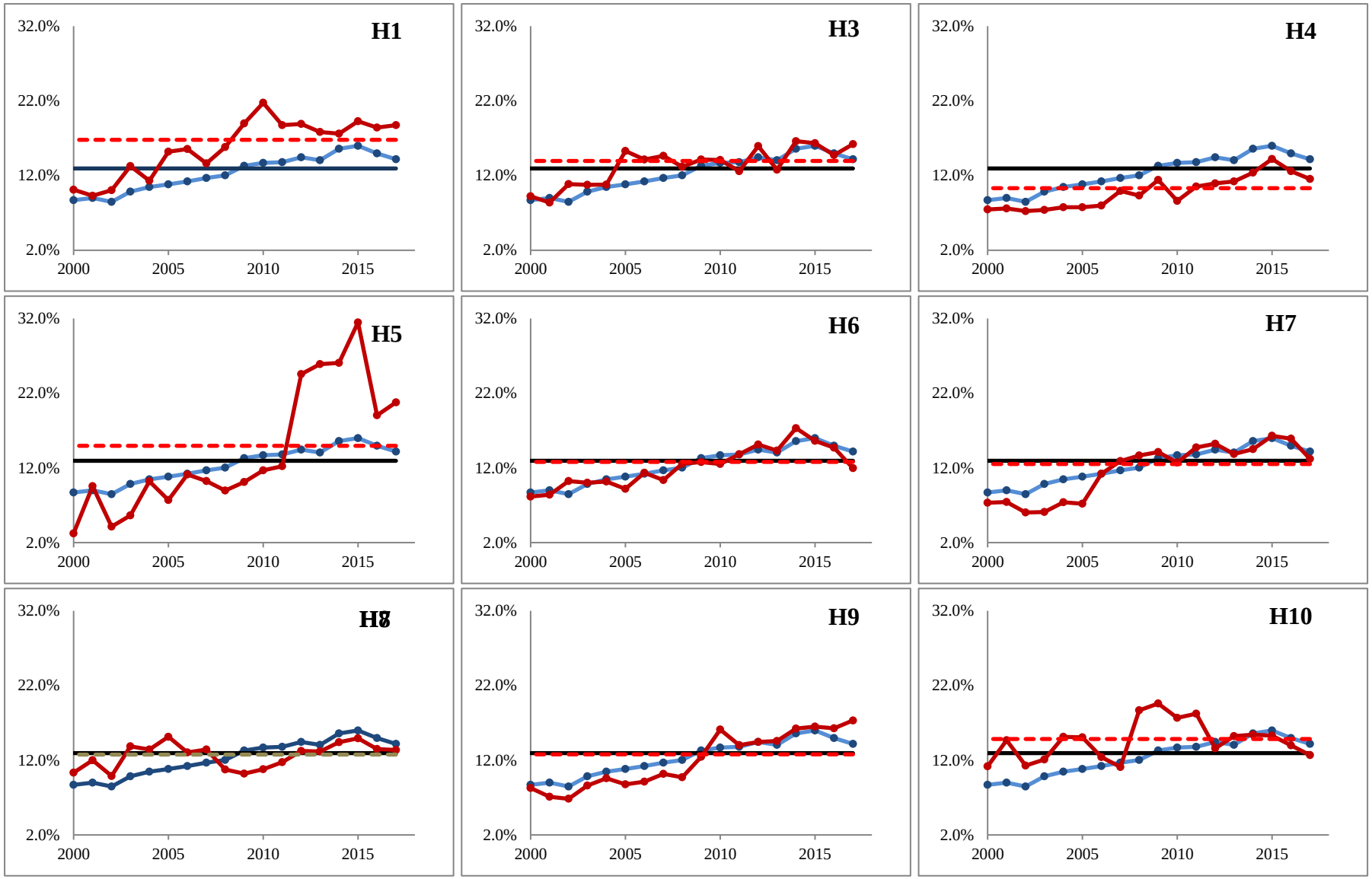

Figure 11.3: Rate of **Emergency** caesarean sections from 2000-2017 for H1-H10. **Blue line:** overall rate, **dark solid line:** Overall mean rate, **Red line:** individual hospital rate, dotted **red line:** individual hospital mean rate

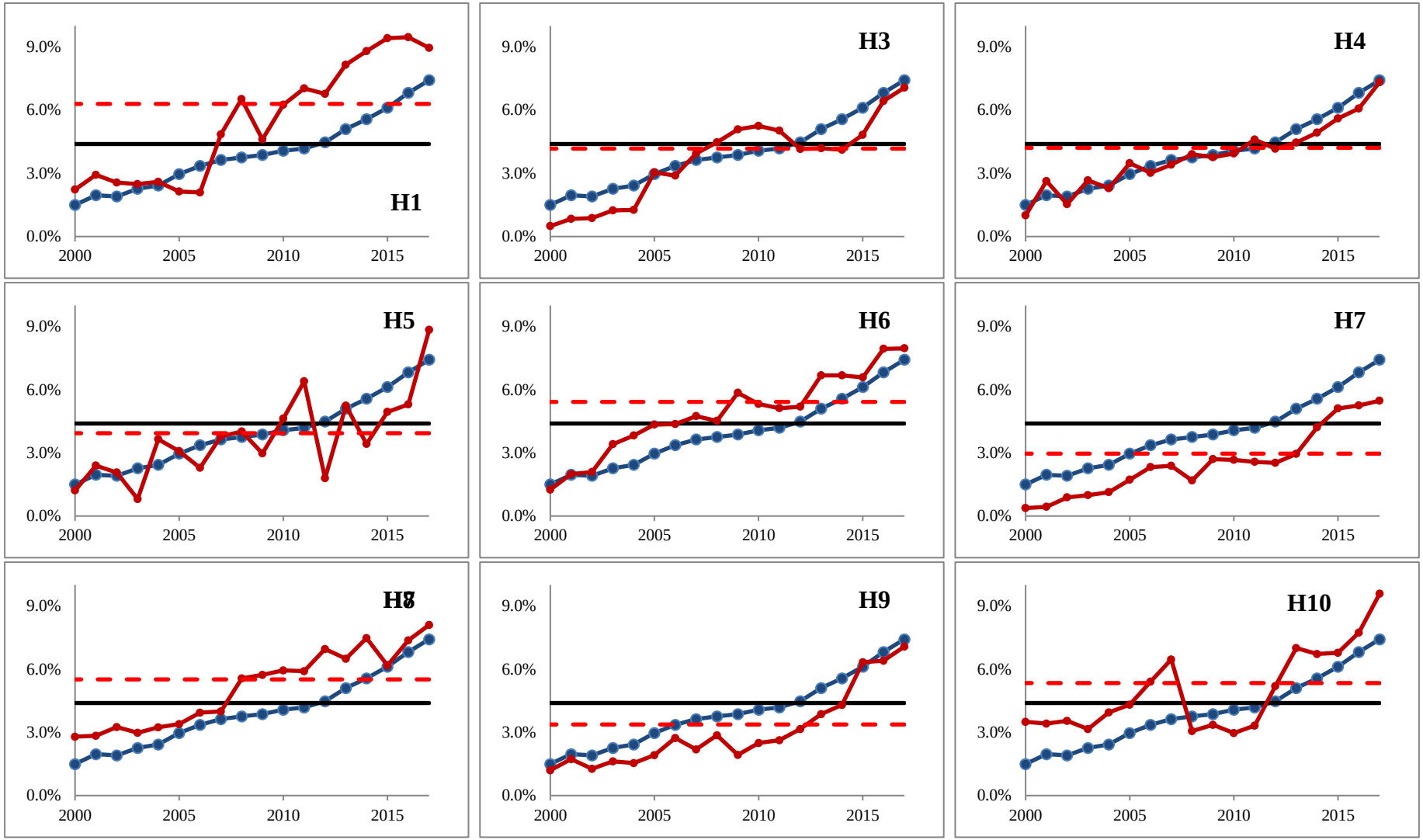

Figure 11.4: Rate of **Elective** caesarean sections from 2000-2017 for H1-H10. **Blue line:** overall rate, **dark solid line:** Overall mean rate, **Red line:** individual hospital rate, dotted **red line:** individual hospital mean rate

11.4.4. Variation across hospitals

To have a closer look at the variation across hospital, the year 2017 data was examined. Table 11.2 shows the total number of deliveries and CS in nine hospitals in 2017. During this year, there were 42744 deliveries in all the hospitals of which 33513 (78.4%) were vaginal deliveries and 9231 (21.6%) were CS. The rate of all CS during this year ranged from 18.7% (H7) to 27.7% (H1). It can also be seen that out of the total deliveries, the majority of CS conducted in 2017 were emergency CS (14.2%) while elective CS represented 7.4%.

The variations across the nine hospitals in all CS, emergency CS, and elective C/S are visualized in P-charts in Figure 11.5. It can be seen that the process is out of control (have special cause variation) in all the three charts with elective CS chart having a relatively more stable picture with two points falling outside the control limits (H7 and H10).

Table 11.2: Rates of caesarean section (elective/caesarean) for 2017 per hospital

		H1 N (%)	H3 N (%)	H4 N (%)	H5 N (%)	H6 N (%)	H7 N (%)	H8 N (%)	H9 N (%)	H10 N (%)	Total N (%)
2017	**All Deliveries**	1852	3593	4366	385	6710	7376	6939	8184	3339	42744
	Vaginal deliveries	1339 (72.3)	2757 (76.7)	3542 (81.1)	271 (70.4)	5373 (80.1)	5998 (81.3)	5450 (78.5)	6187 (75.6)	2596 (77.7)	33513 (78.4)
	All C/S rate	513 (27.7)**	836 (23.3)	824 (18.9)	114 (29.6)	1337 (19.9)	1378 (18.7)*	1489 (21.5)	1997 (24.4)	743 (22.3)	9231 (21.6)
	Emergency CS	347 (18.7)	582 (16.2)	504 (11.5)	80 (20.8)	803 (12.0)	974 (13.2)	927 (13.4)	1418 (17.3)	423 (12.7)	6058 (14.2)
	Elective CS	166 (9.0)	254 (7.1)	320 (7.3)	34 (8.8)	534 (8.0)	404 (5.5)	562 (8.1)	579 (7.1)	320 (9.6)	3173 (7.4)

CS: *Caesarean Section,* ***:** *lowest CS values,* ****:** *highest CS value,* **All CS rate:** *includes both emergency and elective CS,* **H2** *excluded from this study*

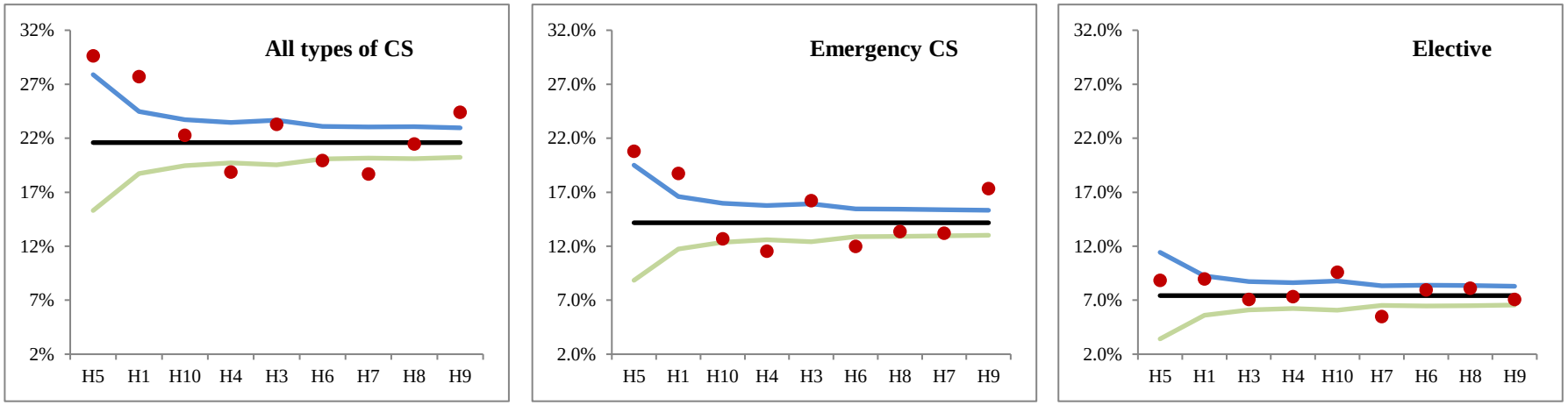

Figure 11.5: P-Control chart caesarean section rate in **2017** per hospital: **black line** (average), **green line** (lower control limit), **blue line** (upper control limit)

11.5. Discussion

This paper examined CS rates over 17 years in nine governorate hospitals. It was shown that since 2000, the rate has been increasing from 10% and reached to 21% in 2017. Additionally, p control charts found evidence of special cause variation. Importantly, all the hospitals (as of 2017) had rates above the WHO accepted rate of 15%.

These rates are comparable or lower than other countries in the region. According to the WHO statistics published in 2016, countries like Iran, Egypt, Libya, Qatar and Saudi had rates of 40%, 28%, 21%, 20%, and 21% respectively. However, the same statistics show that some neighbouring countries have lower rates like Kuwait, United Arab Emirates and Bahrain with rates of 12%, 7.5% and 5.4% (World Health Organization 2016).

Although CS rates in Oman are lower than some countries within the East Mediterranean region, these rates are increasing and should be further investigated to determine if this increase can be attributed to clinical conditions of Omani women. Not only because CS are associated with higher costs, but as reported by the WHO might not have additional benefits to mother or their babies and can sometimes be associated with negative consequences and health complications (Betrán et al. 2016).

Three published studies were found that reviewed risk factors and reasons for CS in Oman. Mathew et al. (2002) reviewed three years data of CS rates in an academic tertiary hospital. They found that during the study period (1998-2001) that CS rate was 13%. They found that fetal distress was the most common indication for conducting CS. More importantly, they concluded that the rate and the indication for CS were similar to other academic hospitals in developed countries. Kazmi et al. (2012) analysed CS rates in a tertiary hospital in Oman according to the Robson's ten-group classification system which is a system that can guide the indication for CS (see Table 11.3). They found that during

the study period (six months), CS was 20% where 33% of all CS is attributed to repeat CS. They concluded that their study results are 'quite reassuring' when compared with other studies even though the CS was above the WHO recommended rate. They recommended that future studies should focus on primary CS and analysis should be guided by the Robson's 10-group classification system. Al Busaidi et al. (2012) case control study included participants from three tertiary hospitals and one government hospital to examine the risk factors, profiles and neonatal outcomes of CS. They found that higher risk of CS was associated with advanced age, previous CS, increased body mass index, extremes of neonatal birth weight and gestational diabetes.

All the three studies were conducted in tertiary care hospitals which mostly receive referrals of complicated cases from all governorate's hospitals. Thus, results might not apply to governorate hospitals included in this study. Therefore, there is a need to examine the indications for CS using the Robson's classification system. This system can also be used to examine the reasons for special cause variation seen in some hospitals as shown by p-chart. In addition to the Robson's classification system, the investigation pyramid tool developed by Mohammed et al. (2005) can be used as a guide for investigating the special cause variation as discussed in chapter 5 (see Figure 5.3). In addition to the patient case-mix identified by the Robson's classification system as a reason for variations across units, the pyramid identifies additional factors for variations like quality of data, infrastructure/resources, process of care and carers characteristics.

Table 11.3: Robson's 10-groups Classification system

No	Groups
1.	Nulliparous, singleton, cephalic, ≥37 weeks, in spontaneous labour
2.	Nulliparous, single cephalic, ≥37 weeks, induced or caesarean section before labour
3.	Multiparous (excluding previous caesarean section), single cephalic, ≥37 weeks, in spontaneous labour
4.	Multiparous (excluding previous caesarean section), single cephalic, ≥37 weeks, induced or caesarean section before labour
5.	Previous caesarean section, single cephalic, ≥37 weeks
6.	All nulliparous breeches
7.	All multiparous breeches (including previous caesarean section)
8.	All multiple pregnancies (including previous caesarean section)
9.	All abnormal lies (including previous caesarean section)
10.	All single cephalic, <37 week(including previous caesarean section)

Sources: (Robson 2001)

11.6. Study limitations

This study has some limitations. First, the reasons for special cause variation were not investigated. This investigation could be done by future qualitative studies using pyramid investigation tool and possibly combined with the Robson's system. Second, a closer examination of data shows that they exhibit over dispersion which is common with large samples sizes causing control limits to be close to each other. As a result, larger number of data points will fall outside the limits causing 'false impression' of special cause variation (Mohammed and Laney 2006). One strategy to deal with over dispersion as recommended is to use Laney's chart which uses another equations to re-calculate the limit but as emphasised by Mohammed and Laney (2006) the Laney's chart, or any other strategy to overcome overdispertion, should be used cautiously. Although these strategies might produce better looking charts with lower data points outside the limits, they do not change the existing fact about special cause variation. Also, data from 17 years ago is not likely to be useful for monitoring purposes, other than to give a historic context.

11.7. Conclusion

This study shows that CS in governorate hospitals of Oman is increasing and is above the WHO recommended rate in all the hospitals. Additionally, these rates varied across hospitals and p-chart showed that this variation is a special cause variation. Future studies need to examine the indications for CS and the reasons for variation.

12. Chapter twelve: Overall discussion and conclusion

12.1. Introduction

This chapter summarizes the findings from the literature reviews and the field studies highlighting the limitations and future implications of these studies which together constitute a preliminary step towards the development of a multidimensional approach to measure quality and safety of care in maternity units in Oman. The thesis considered five objectives which are stated below.

- To measure patient safety culture level
- To examine the association between nurse's nationality and patient safety culture
- To validate an Arabic language survey to measure maternal satisfaction about the childbearing experience.
- To measure patient satisfaction about the childbearing experience
- To use statistical process control charts for examining caesarean section rates across maternity units.

12.2. Summary of the literature review chapters

Four literature reviews were conducted to examine the application of the three monitoring approaches that were adopted for this research. In brief, it was concluded from the literature review chapters that the measurement of patient safety culture in maternity units is increasing but the effectiveness of any interventions to improve patient safety culture is yet to be examined and evaluated. Additionally, the available surveys to measure maternal satisfaction give limited options to select from and raise calls for more comprehensive surveys. Although SPC might be a useful tool for measuring variation, the challenges associated with its use need to be addressed before making firm conclusions about its full

potential. The field studies have found that the level of patient safety culture in maternity units is low in most dimensions and varied by hospital, nurses' nationality and years of experience. The CCSS was found to have good psychometric properties and can be used to measure change in maternal satisfaction overtime. Maternal satisfaction in maternity units was found to be high with significant difference between the different groups of patients. Rates of caesarean sections was found to be higher than the recommended and has been increasing since the year 2000 with wide variation across the nine hospitals. To enhance readability of this chapter, the following sections provide a summary of these reviews and the main findings.

12.2.1. Patient safety culture in maternity units

This review, based on 28 studies, summarized the different purposes, tools and designs used for examining patient safety culture in maternity units . It was found that measuring patient safety culture in maternity is being increasingly emphasized and was mostly assessed quantitatively using the safety attitude questionnaire. In addition, obtaining an adequate response rate appeared to be challenging but higher response rates were observed when surveys were handed directly to participants. This review suggested that guidelines should be developed on the frequency of measuring patient safety culture and future studies should find ways to involve patients in measuring patient safety culture.

12.2.2. Interventions to improve patient safety culture in maternity

This review included eleven studies and summarized the interventions used to improve patient safety culture and their impact in maternity units. It was found that interventions were either single or multiple for a duration ranging from 3 months to four years. The single interventions were mostly training programs while the multiple interventions involved a number of activities like expert reviews, protocol development and clinical

training. Ten of the 11 included studies reported that patient safety culture had improved significantly after the intervention. The review suggested that future studies should determine the cost of the intervention and the relative effectiveness of each intervention. Additionally, ways need to be explored on how to involve patients in planning and implementing the intervention.

12.2.3. Arabic surveys to measure maternal satisfaction with childbirth services

This review examined seven Arabic surveys that have been used to measure maternal satisfaction about childbearing services. The review concluded that there are few surveys that are available for use in an Arabic context. Those surveys have varying psychometric properties, have limited inclusion criteria, and were used to measure maternal satisfaction at different stages after childbirth. The review called for the need for Arabic surveys that are rigorously evaluated in different contexts with wider inclusion criteria.

12.2.4. Understanding performance indicators using Statistical Process Control (SPC) in maternity units

This review included 26 studies and examined the use of SPC charts for understanding performance indicators used in maternity units. It was found that around 48-materntiy related indicators were analysed using different types of charts but the cumulative sum chart was the most commonly used chart. Additionally, these charts were positively perceived but investigating the special cause variation and appropriately setting control limits were two key challenges to be addressed by future studies. It was concluded that applying SPC charts in maternity units for monitoring and improvement initiatives is both feasible and useful. This review suggested that there is a need to: (a) develop reporting guidelines for SPC charts and, (b) develop a framework for investigating special cause variation.

12.3. Summary of the study chapters

This thesis had five chapters that described the studies conducted to address the research aim and objectives. All the studies were conducted in maternity units of the ten governorate hospitals that are under the umbrella of the Ministry of Health in Oman. One hospital was excluded from the patient satisfaction study and the cesarean section rate study because in this hospital no caesarean sections are conducted and only four patients were admitted during the study period. The following sections provide a summary of the main findings from these studies.

12.3.1. Patient safety culture in maternity units in Oman

In this study, 82% (735 out of 892) of staff completed the safety attitude questionnaire in the ten maternity units. It was found that the overall safety culture score is below the target in the ten hospitals (below 4.0). The job satisfaction domain had the highest score while stress recognition was the lowest. A higher overall score was observed among more experienced and non-Omani participants. Nurses and physicians had similar overall safety scores. Analysis by SPC appears to be useful in visually detecting and determining the variation type in safety scores across hospitals. The study concluded that future qualitative studies are needed to examine the reasons for variation, how best to reduce these variations, and how to improve safety culture levels.

12.3.2. The association between nurses' nationality and patient safety culture in Oman

In this study, 542 nurses (out of 735 participants) completed the safety attitude questionnaire. Overall, it was found that the nationality of nurses has an influence on their perception about safety culture. The mean safety score for non-Omani nurses was significantly higher than the Omani nurses. Non-Omani nurses have a more positive perception of PSC than Omani nurses in all domains except in respect of stress

recognition. In conclusion, decision makers, directors, and clinicians should consider these differences in perceptions when designing interventions to enhance PSC (e.g. training, awareness, and orientation plans). Qualitative studies are needed to understand these variations and determine the extent to which they are warranted or unwarranted.

12.3.3. Validating an Arabic survey to measure childbearing satisfaction in Oman

In this study, an Arabic survey to measure maternal satisfaction was developed by merging two existing English surveys. The study described the translation and validation of the new Childbirth Care Satisfaction Survey (CCSS). It was found that the CCSS demonstrated good face validity, content validity, internal reliability, construct validity and discriminant validity. It was concluded that the short and easy to use CCSS can provide valuable information to clinicians and decision makers about the quality of maternity services.

12.3.4. Maternal satisfaction in Oman

In this study, 958 (out of 3566) mothers completed the CCSS in the nine maternity units in Oman. It was found that mothers' satisfaction about childbearing in Oman is high. Overall, mothers who delivered vaginally, had a previous delivery, or delivered previously in the same hospital were significantly more satisfied compared with mothers who had caesarean section delivery, delivered for the first time, or delivered in the hospital for the first time. No difference in satisfaction was observed between mothers with and without a chronic condition. Proportional SPC showed that across all survey items, the percentage of positive responses for all hospitals were within the control limit except for one hospital which fell outside the limits which merits further study. Future studies need to examine how to improve the areas with the lowest satisfaction and to understand the variation in satisfaction score across different categories of participants and between hospitals.

12.3.5. Caesarean section rates in Oman

In this study, 17 years data for caesarean section rates were collected from the annual health report published by the MoH. It was found that the rates are above the acceptable rates set by the WHO. In addition, these rates were increasing since 2000 and rates varied significantly across hospitals. Future studies are needed to examine if these rates can be explained clinically, how variations across hospitals can be reduced and if these variations are warranted or unwarranted.

12.4. Contribution of the research

This research has focused on maternity care - a nationally and internationally important area for healthcare. The literature review chapters and the study chapters have contributed to the existing literature in different ways. These contributions are summarized below.

Systematically reviewing the literature about the application of the three monitoring approaches in maternity has provided a more comprehensive picture about the current practices, gaps and recommendations for future studies. As far as the researcher is aware, a systematic review of the application of these approaches in maternity has not been previously published. These review chapters have confirmed the existing literature about the increasing emphasis and feasibility of using patient safety culture, maternal satisfaction and control charts of caesarean section rate for monitoring and improving the quality and patient safety in healthcare settings. Additionally, the key findings from the narrative reviews can guide future researchers on selecting the appropriate tools and designs for measuring quality and safety in maternity units. For example, the patient satisfaction review has identified that the available Arabic surveys are limited with varying psychometric properties and limited inclusion criteria. Thus, future researchers and health planners should consider the inclusion

criteria and the study context before selecting any of those surveys. In the SPC review, an existing tool (Koetsier tool) was used to assess the quality of SPC reporting. This tool can be used by future researchers to enhance the reporting of SPC charts.

The study chapters have established the current national levels of patient safety culture, patient satisfaction and caesarean section rates. These levels have not been reported before and offer a baseline from which on-going monitoring and improvement efforts can be assessed.

The research studies have provided information on how safety culture level, patient satisfaction levels and caesarean section rates vary across hospitals and across different groups of participants. The use of SPC charts for examining variations in patient safety culture and patient satisfaction levels is not common in the literature and thus suggests wider application of these tools in healthcare settings. However, future studies are needed to address the challenges associated with the use of SPC before expanding its use and before using it as a base for improvement.

A new survey was developed and validated. The new CCSS tool was found to have good psychometric properties. It can be used in Oman, as well as other Arab countries, to establish maternal satisfaction levels and to follow-up changes in satisfaction over time.

12.5. Overall synthesis, policy implications and future work of the five field studies:

A number of policies can be introduced based on this research's findings. These implications are outlined below.

- The new CCSS tool developed as part of this research was found to have good psychometric properties and thus, can be adopted by all maternity units to continually measure the change in satisfaction level over time and to test the

implications of any intervention on satisfaction level. Additionally, it was shown that the SAQ has a good response rate and can produce sensible results. Therefore, it might be logic and wise that the same tools to be used for measuring safety culture in maternity and other units so that change overtime can be evaluated instead of flipping from one tool to another.

- As discussed in chapter 1, the PSMMF by Vincent et al. (2013) could be used as a guide for developing a national measurement system (see Figure 1.2). However, this framework should be introduced cautiously as its effectiveness and usefulness in developing countries has not be tested even though there is a 'limited' evidence about its effectiveness in developed countries. As discussed in chapter 1, the three approaches used in this research fall under two dimensions of the PSMMF namely past harm, and anticipation and preparedness but do not cover the other three dimensions. It is important, however, that the framework's effectiveness is periodically evaluated before investing on fully expanding the framework and before aiming to cover the other dimensions. Thus, future work if needed to address the other dimensions that need to be strengthened, what additional tools might be needed and what resources need to be in place to ensure maximum use of framework.
- Monitoring is not an aim but rather a mean to facilitate quality improvement. As stressed by Vincent et al. (2013) and as shown by the PSMMF, any approach used to measure patient safety should not be a tick box exercise. Rather, more effort should be in place to facilitate the integration of results from different sources for enhancing and improving quality and patient safety at maternity units or any other unit. One important device that could be used to foster improvement is to feedback

results to the different stakeholders. There are different types, ways and levels for providing feedback. Different studies have shown that providing feedback is a powerful intervention tool that can improve experience, positively influence professional intention to improve practices and can effectively improve quality of care (Jamtvedt et al. 2006; Ivers et al. 2014; Kristensen and Hounsgaard 2014; Gude et al. 2016; Hysong et al. 2016; Reynolds et al. 2016). Future work is needed to co-design a feedback system with different stakeholders building upon existing ways of communication. Vincent et al. (2013) suggested a number of ways to deliver feedback that might be considered. Examples of these channels include safety alerts, safety newsletters and the hospital intranet system. Other existing channels that could be considered at the governorate hospital level include the annual top management quality system reviews and the monthly clinical team meetings. At the national level, the annual health year plan review and the regular Directors General meetings could be used as channels for feedback.

- For feedback results to be acted upon, effort should be made to change the behaviour of different stakeholders. One model that can be adopted to change the behaviour is the COM-B model. According to the COM-B model, people can change their behaviour (B) if they are capable (C), have opportunity (O), and have the motivation (M) (Barker et al. 2016). Strengthening leadership and using patient stories are examples of tools that can be used to enhance the capability, opportunity and motivation towards improving the quality and patient safety (Eisenberg et al. 2005; Künzle et al. 2010).
- The feasibility experienced while deploying the three monitoring approaches suggest that these approaches can be used for continuously monitoring progress

over time within maternity units and possibly within other units in the governorate hospitals. It is important that these approaches are integrated with other existing measurement tools like the incident reporting system, mortality statistics and auditing results. The aim of the integration is to have a more comprehensive view of quality and safety so that other dimensions of PSMMF are covered. Any tool/form of integration can be used as far as the results from the different monitoring tools are used to improve the current level of quality and safety. The balanced score card is one tool that can be used to integrate these monitoring tools where a number of indicators are identified and agreed to be key for each clinical service (Bisbe and Barrubés 2012). Vincent et al. (2013) provided a number of case studies where different tools have been used to integrate information from different sources. For example, an automated information management system has been used by the the Great Ormond Street Hospital NHS trust to help produce for each clinical unit a monthly harm report that cover different indicators including the hand hygiene compliance rate, the WHO surgical safety checklist compliance rate, and medication errors. Another example is the use of dashboards and reports where data is collected from different sources including patient survey, clinical audit and through internal database. A third example is the one used by the Intermountain Healthcare in the USA where they developed a dimensional database with web-enabled reporting and SPC charts on demand.

- Variation in perception about safety culture between different categories should be considered before planning and designing any safety and quality training programmes. For example, recognizing the differences in perception about patient safety culture between Omani and non-Omani nurses may suggest that training

programs need to be tailored to each group of participants. Similarly, different training packages might be needed for staff with different levels of experience in maternity units.

- Future studies need to examine if the variation in caesarean section rate across maternity units is warranted or unwarranted.
- The high maternal satisfaction score is a strength that the MoH should aim to sustain and improve. The differences in satisfaction score between different categories of participants (for example, vaginal vs caesarean delivery, and first time vs. non-first time delivering women) may suggest that different actions (e.g. orientation plans) need to be made for each group.

12.6. Research limitations

Despite the potential impact and policy implications of the research findings, there are a number of limitations that need to be discussed.

- The selection of the monitoring approaches was limited to three approaches, patient safety culture, maternal satisfaction and control charts of caesarean section rate. These approaches fall under two dimensions of the PSMMF while the other three dimensions were not covered. Using the three approaches alone does not constitute a comprehensive monitoring system as defined by the PSMFF.
- Another limitation is that the selection of the monitoring approaches has not involved the stakeholders which might undermine the usefulness and acceptance of the results. Nonetheless, although the stakeholders were not involved in the selection of the approaches, they were very positive about the selected approaches as evidenced by their full cooperation and full enrolment throughout the study periods. Additionally, informal positive perceptions (not documented in this

research) were given to the researcher about the eagerness of executive directors to view and discuss the results. More formal methods of bringing the voice of stakeholders to the design and development of the monitoring system would be useful.

- With limited time and resources, it was not feasible to feedback the results to stakeholders. But this will be considered as a post doc project as discussed above.
- The cost of measuring patient safety culture and patient satisfaction was not determined. However, these costs are expected to be within affordable range. Since the CCSS survey developed as part of this research had good psychometric properties, no additional costs to validate a new survey will be required for future follow up studies. Additionally, data related to caesarean section involved no extra costs as these data are collected routinely by the Ministry of Health and thus, keeping data collection at minimal costs. Moreover, the Ministry of Health has existing staff and infrastructure to undertake surveys so no new resources are required.
- As is the case with cross sectional surveys they cannot explain the reasons for variation across hospitals and across different groups of participants. The use of qualitative methods to examine qualitative concepts like safety culture and patient satisfaction would have added a lot to this research and could have answered some of the questions not answered by this research. Although the option of including qualitative aspect to this research was considered at some point of research, it was decided that with the multiple systematic reviews and the multiple field studies deployed in this research, the available time and resources would not permit adding a qualitative study to the research. However, it is important that future

qualitative studies are included to address the important questions not addressed by this research.

- The study examining the association between nurses' nationality and safety culture (chapter 8) had a high percentage of missing data (44.7%) and the extent to which the study's findings hold with better response rates remains to be seen.
- The patient satisfaction study (chapter 10) had a low response rate. Although the number of participants was sufficient to allow satisfactory analysis, future studies need to ensure higher response rates.

12.7. Conclusion

This research aimed at developing a national quality and patient safety monitoring system focusing on patient safety culture, patient satisfaction and caesarean section rates in maternity units in Oman. These three approaches cover two out of the five dimensions of the PSMMF. The research started with four systematic literature reviews examining the application of these approaches in maternity units followed by five field studies. The field studies demonstrated that it is feasible to use the three approaches to monitor quality and safety in maternity units. However, further work is required to use these data to enhance the quality and safety of care. Additionally, future work is needed to cover the other three dimensions of the PSMMF.

References

Abbott, S., Rogers, M. and Freeth, D. (2012) Underpinning safety: Communication habits and situation awareness. *British Journal of Midwifery* 20 (4), 279-284 6p.

Abiri, O. (2017) *Differences in Nurses' Perceptions of Safety Culture, Nurse-Physician Collaboration, and Level of Job Satisfaction Related to the Type of Obstetrical Physician Service Delivery Model Utilized*. PhD. Florida Atlantic University: Florida Atlantic University.

Aboshaiqah, A. E. (2010) *Patients safety culture: A baseline assessment of nurses' perceptions in a Saudi Arabia hospital*. Wayne State University, Michigan. https://digitalcommons.wayne.edu/oa_dissertations/71 Accessed 12 March 2018.

Ackenbom, M. F., Myers, J., Schwartz, N., Beshara, M. N. and Srinivas, S. K. (2014) The brief debrief: Improving communication and patient safety culture on labor and delivery. *Obstetrics and Gynecology* 123, 133S-134S.

AHRQ (2007) PSNET Patient Safety Network. Patient safety. https://psnet.ahrq.gov/glossary/P Accessed 15th April 2019.

Al-Mandhari, A., Al-Zakwani, I., Al-Kindi, M., Tawilah, J., Dorvlo, A. S. and Al-Adawi, S. (2014) Patient safety culture assessment in oman. *Oman Med J* 29 (4), 264-70.

Al-Mandhari, A. S., Hassan, A. A. and Haran, D. (2004) Association between perceived health status and satisfaction with quality of care: Evidence from users of primary health care in Oman. *Family Practice* 21 (5), 519-527.

Al Busaidi, I., Al-Farsi, Y., Ganguly, S. and Gowri, V. (2012) Obstetric and non-obstetric risk factors for cesarean section in oman. *Oman medical journal* 27 (6), 478-481.

Albalushi, R. M., Sohrabi, M.-R. and Kolahi, A.-A. (2012) Clients' satisfaction with primary health care in muscat. *International journal of preventive medicine* 3 (10), 713-717.

Albolino, S., Dagliana, G., Illiano, D., Tanzini, M., Ranzani, F., Bellandi, T., Fusco, I., Bellini, I., Carreras, G., Di Tommaso, M. and Tartaglia, R. (2018) Safety and quality in maternal and neonatal care: the introduction of the modified WHO Safe Childbirth Checklist. *Ergonomics* 61 (1), 185-193.

Alemi, F., Torii, M., Clementz, L. and Aron, D. C. (2012) Feasibility of real-time satisfaction surveys through automated analysis of patients' unstructured comments and sentiments. *Quality Management In Health Care* 21 (1), 9-19.

Allen, S., Chiarella, M. and Homer, C. S. (2010) Lessons learned from measuring safety culture: an Australian case study. *Midwifery* 26 (5).

Almutairi, A. F., Gardner, G. and McCarthy, A. (2013) Perceptions of clinical safety climate of the multicultural nursing workforce in Saudi Arabia: a cross-sectional survey. *Collegian (Royal College Of Nursing, Australia)* 20 (3), 187-194.

Amaya Arias, A. C., Cortés Díaz, M. L., Gómez, L. M. and Eslava-Schmalbach, J. H. (2016) Effectiveness of three intervention programs designed to implement WHO Safe Childbirth Checklist in Colombia. *International Journal for Quality in Health Care* 28, 47-48.

Ammouri, A. A., Tailakh, A. K., Muliira, J. K., Geethakrishnan, R. and Al Kindi, S. N. (2015) Patient safety culture among nurses. *International Nursing Review* 62 (1), 102-110.

Anderson, A. (2013) Ten years of maternity claims: an analysis of the NHS Litigation Authority data–key findings. *Clinical Risk* 19 (1), 24-31.

Andrews, C., Whatley, C., Smith, M., Brayton, E. C., Simone, S. and Holmes, A. V. (2018) Quality-Improvement Effort to Reduce Hypothermia Among High-Risk Infants on a Mother-Infant Unit. *Pediatrics* 141 (3).

Ansari, S. S., Rayfield, M. and Prosser-Snelling, E. (2018) Human factors training to improve safety culture in maternity: A quality improvement project. *International Journal of Obstetrics and Gynaecology* 125, 42-43.

Antón, J. I., Ferre, Z. and Triunfo, P. (2018) The impact of the legalisation of abortion on birth outcomes in Uruguay. *Health Economics (United Kingdom)* 27 (7), 1103-1119.

Appleby, J., Raleigh, V., Frosini, F., Bevan, G., Gao, H. and Lyscom, T. (2011) Variations in health care. *The good, the bad and the inexplicable. London: The King's Fund*.

Ari, M., L., W. S. and A., A. O. B. (2011) Factors affecting nurses' perceptions of patient safety. *International Journal of Health Care Quality Assurance* 24 (4), 274-283.

Athwal, S., Harrison, K. and Swingler, R. (2018) Multi-professional maternity team handover. *International Journal of Obstetrics and Gynaecology* 125, 41.

Aty, A., Meky, F., Morsy, M. and El Sayed, M. (2014) Overall adequacy of antenatal care in Oman: secondary analysis of national reproductive health survey data, 2008. *Eastern Mediterranean Health Journal* 20 (12), 781-788.

Ausserhofer, D., Schubert, M., Engberg, S., Blegen, M., De, G. and Schwendimann, R. (2012) Nurse-reported patient safety climate in Swiss hospitals: a descriptive-explorative substudy of the Swiss RN4CAST study. *Swiss Medical Weekly* 142, w13501-w13501.

Awadalla, H. I., Kamel, E. G., Mahfouz, E. M. and Refaat, T. M. (2009) Evaluation of maternal and child health services in El-Minia City, Egypt. *Journal of Public Health* 17 (5), 321-329.

Ayers, S. and Pickering, A. D. (2005) Women's expectations and experience of birth. *Psychology & Health* 20 (1), 79-92.

Baghurst, P. A. (2013) The case for retaining severe perineal tears as an indicator of the quality of obstetric care. *The Australian & New Zealand Journal Of Obstetrics & Gynaecology* 53 (1), 3-8.

Bahl, R., Tomlinson, A., Taylor, K. M., Sheldon, S. J. and Basude, S. (2018) Supporting staff in striving for safety in maternity - learning from incidents. *International Journal of Obstetrics and Gynaecology* 125, 105.

Baig, K. and Shahid, F. (2017) Training healthcare workers to improve the quality of maternal, newborn & child healthcare services in marginalized settings. *International Journal for Quality in Health Care* 29, 41-42.

BAKER, S. R., CHOI, P. Y. L., HENSHAW, C. A. and TREE, J. (2005) 'I Felt as though I'd been in Jail': Women's Experiences of Maternity Care during Labour, Delivery and the Immediate Postpartum. *Feminism & Psychology* 15 (3), 315-342.

Balsyte, D., Schaffer, L., Burkhardt, T. and et al. (2010) Continuous independent quality control for fetal ultrasound biometry provided by the cumulative summation technique. 35 (4), 449-455.

Barker, F., Atkins, L. and de Lusignan, S. (2016) Applying the COM-B behaviour model and behaviour change wheel to develop an intervention to improve hearing-aid use in adult auditory rehabilitation. *International journal of audiology* 55 (sup3), S90-S98.

Bashour, H. N., Kanaan, M., Kharouf, M. H., Abdulsalam, A. A., Tabbaa, M. A. and Cheikha, S. A. (2013) The effect of training doctors in communication skills on women's satisfaction with doctor-woman relationship during labour and delivery: a stepped wedge cluster randomised trial in Damascus. *BMJ Open* 3 (8).

Basude, S., Tomlinson, A., Grzyb-Yung, E., Morgan, R., Sheldon, S. J. and Bahl, R. (2018) Celebrating human factors week: Improving staff engagement and awareness in a tertiary maternity unit. *International Journal of Obstetrics and Gynaecology* 125, 100.

Beattie, M., Murphy, D. J., Atherton, I. and Lauder, W. (2015) Instruments to measure patient experience of healthcare quality in hospitals: a systematic review. *Systematic Reviews* 4 (1), 97.

Bélanger-Lévesque, M.-N., Pasquier, M., Roy-Matton, N., Blouin, S. and Pasquier, J.-C. (2014) Maternal and paternal satisfaction in the delivery room: a cross-sectional comparative study. *BMJ Open* 4 (2), e004013.

Benage, M., Greenough, P. G., Vinck, P., Omeira, N. and Pham, P. (2015) An assessment of antenatal care among Syrian refugees in Lebanon. *Conflict And Health* 9 (8).

Benn, J., D'Lima, D., Moore, J., Wei, I. and Arnold, G. (2014) Enhanced feedback from perioperative quality indicators: studying the impact of a complex quality improvement intervention. *BMJ Quality & Safety* 23 (4), 351-352.

Benneyan, J. C., Lloyd, R. C. and Plsek, P. E. (2003) Statistical process control as a tool for research and healthcare improvement. *Quality and Safety in Health Care* 12 (6), 458-464.

Bergs, C. J. (2015) *Perceived barriers to quality improvement and reduced medical error: A quantitative study*. US: University of Phoenix. http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2015-99200-190&site=ehost-live Accessed 12 April 2018.

Betrán, A. P., Torloni, M. R., Zhang, J.-J., Gülmezoglu, A., Section, W. W. G. o. C., Aleem, H., Althabe, F., Bergholt, T., de Bernis, L. and Carroli, G. (2016) WHO statement on caesarean section rates. *BJOG: An International Journal of Obstetrics & Gynaecology* 123 (5), 667-670.

Betrán, A. P., Vindevoghel, N., Souza, J. P., Gülmezoglu, A. M. and Torloni, M. R. (2014) A systematic review of the Robson classification for caesarean section: What works, doesn't work and how to improve it. *PLoS ONE* 9 (6).

Biau, D. J., Resche-Rigon, M., Godiris-Petit, G., Nizard, R. S. and Porcher, R. (2007) Quality control of surgical and interventional procedures: a review of the CUSUM. *Quality and Safety in Health Care* 16 (3), 203-207.

Bisbe, J. and Barrubés, J. (2012) The Balanced Scorecard as a Management Tool for Assessing and Monitoring Strategy Implementation in Health Care Organizations. *Revista Española de Cardiología (English Edition)* 65 (10), 919-927.

Blumenthal, E. A., Sim, M. S. and Carranza, L. (2017) Improving safety on labor and delivery through team huddles and teamwork training. *Reproductive Sciences* 24 (1), 247A.

Bodur, S. and Filiz, E. (2009) A survey on patient safety culture in primary healthcare services in Turkey. *International Journal for Quality in Health Care* 21 (5), 348-355.

Boe, D. T., Riley, W. and Parsons, H. (2009) Improving service delivery in a county health department WIC clinic: an application of statistical process control techniques. *American Journal of Public Health* 99 (9), 1619-1625.

Bondevik, G. T., Hofoss, D., Hansen, E. H. and Deilkås, E. C. T. (2014) The safety attitudes questionnaire – ambulatory version: psychometric properties of the Norwegian translated version for the primary care setting. *BMC Health Services Research* 14 (1), 139.

Booth, A., Papaioannou, D. and Sutton, A. (2012) *Systematic approaches to a successful literature review.* sagepublications. London.

Bougmiza, I., Ghardallou, E. L. M., Zedini, C., Lahouimel, H., Nabli-Ajmi, T., Gataa, R., Touati, I., Khairi, H. and Mtiraoui, A. (2011) Assessment of patient satisfaction in hospital gynecology obstetrics Sousse, Tunisia. *Pan African Medical Journal* 8 (44).

Boulkedid, R., Alberti, C. and Sibony, O. (2013) Quality indicator development and implementation in maternity units. *Best Practice & Research: Clinical Obstetrics & Gynaecology* 27 (4), 609-619.

Boulkedid, R., Sibony, O., Bossu-Salvador, C., Oury, J. F. and Alberti, C. (2010) Monitoring healthcare quality in an obstetrics and gynaecology department using a CUSUM chart. *BJOG* 117 (10), 1225-35.

Boyce, M. B. and Browne, J. P. (2013) Does providing feedback on patient-reported outcomes to healthcare professionals result in better outcomes for patients? A systematic review. *Quality of Life Research* 22 (9), 2265-78.

Briggs, S. R. and Cheek, J. M. (1986) The role of factor analysis in the development and evaluation of personality scales. *Journal of personality* 54 (1), 106-148.

Britto, M. T., Fuller, S. C., Kaplan, H. C., Kotagal, U., Lannon, C., Margolis, P. A., Muething, S. E., Schoettker, P. J. and Seid, M. (2018) Using a network organisational architecture to support the development of Learning Healthcare Systems. *BMJ Quality & Safety* 27 (11), 937-946.

Burke, C., Grobman, W. and Miller, D. (2013) Interdisciplinary Collaboration to Maintain a Culture of Safety in a Labor and Delivery Setting. *Journal of Perinatal & Neonatal Nursing* 27 (2), 113-123 11p.

Campbell, S. M., Roland, M. O. and Buetow, S. A. (2000) Defining quality of care. *Social Science & Medicine* 51 (11), 1611-1625.

Carmouche, M. F. (2017) *Emergency obstetric simulation drills as a strategy to execute a multidisciplinary protocol with emphasis on safety culture evaluation, team synergy and team competency: A DNP project*. Southeastern Louisiana University: Southeastern Louisiana University.

Carneiro de Azevedo, K. C., Pereira de Melo Alves, A. M., Félix, Z. C. and Gomes Viana, A. C. (2016) Implementation of the patient safety core in a health service. *Journal of Nursing UFPE* 10 (12), 4692-4695.

Carr-Hill, R. A. (1992) The measurement of patient satisfaction. *Journal of Public Health* 14 (3), 236-249.

Center for Evidence Based Management (2014) *Critical Appraisal of a Cross-Sectional Study (Survey).* The Center for Evidence-Based Management. https://www.cebma.org/

Chang, A. M., Morrison, J. and Biggs, J. S. (1979) Control chart for urinary oestriol excretion during pregnancy. *The Australian & New Zealand Journal Of Obstetrics & Gynaecology* 19 (3), 143-147.

Channing, S., Ryan, N., Collins, K., Barnes, S., Mears, J., Draycott, T. and Siassakos, D. (2015) Assessing the impact on safety culture of introducing a multi-professional team training day to a Gynaecology unit. *International Journal of Gynecology and Obstetrics* 131, E75.

Chiriboga, N., Cortez, J., Pena-Ariet, A., Makker, K., Smotherman, C., Gautam, S., Trikardos, A. B., Knight, H., Yeoman, M., Burnett, E., Beier, A., Cohen, I. and Hudak, M. L. (2018) Successful implementation of an intracranial hemorrhage (ICH) bundle in reducing severe ICH: a quality improvement project. *Journal Of Perinatology: Official Journal Of The California Perinatal Association*.

Colla, J. B., Bracken, A. C., Kinney, L. M. and Weeks, W. B. (2005) Measuring patient safety climate: a review of surveys. *Quality & safety in health care* 14 (5), 364-366.

Collins, K. J. and Draycott, T. (2015) Measuring quality of maternity care. *Best Practice & Research Clinical Obstetrics & Gynaecology* 29 (8), 1132-1138.

Comas, C., Echevarria, M., Rodríguez, I., Sabrià, J. and Serra, B. (2011) Analysis of quality of nuchal translucency measurements. *Donald School Journal of Ultrasound in Obstetrics and Gynecology* 5 (2), 127-132.

Cordell, V., Bahl, R. and Basude, S. (2018) Building positive work culture together: Experience at University hopsitals Bristol NHS foundation trust. *International Journal of Obstetrics and Gynaecology* 125, 100.

Cox, S. and Flin, R. (1998) Safety culture: Philosopher's stone or man of straw? *Work & Stress* 12 (3), 189-201.

Creswell, J. W. (2013) *Qualitative inquiry & research design: choosing among five approaches.* Vol. Third. London: SAGE.

Creswell, J. W., Klassen, A. C., Plano Clark, V. L. and Smith, K. C. (2011) Best practices for mixed methods research in the health sciences. *Bethesda (Maryland): National Institutes of Health*.

Critical Appraisal Skills Programme (2014) *CASP Qualitative Checklist.* https://casp-uk.net/casp-tools-checklists/

Crow, H., Gage, H., Hampson, S., Hart, J., Kimber, A., Storey, L. and Thomas, H. (2002) Measurement of satisfaction with health care: Implications for practice from a systematic review of the literature. *Health technology assessment*.

Currie, L. (2009) Exploring the perceptions of midwifery staff about safety culture. *British Journal of Midwifery* 17 (12).

De Santis, G., Tocchioni, V., Seghieri, C. and Nuti, S. (2018) Socio-demographic determinants of women's satisfaction with prenatal and delivery care services in Italy. *International Journal for Quality in Health Care* 30 (8), 594-601.

De Vos, M., Graafmans, W., Kooistra, M., Meijboom, B., Van Der Voort, P. and Westert, G. (2009) Using quality indicators to improve hospital care: a review of the literature. *International Journal for Quality in Health Care* 21 (2), 119-129.

Deilkås, E. and Hofoss, D. (2010) Patient safety culture lives in departments and wards: multilevel partitioning of variance in patient safety culture. *BMC health services research* 10, 85-85.

Deilkås, E. T. and Hofoss, D. (2008) Psychometric properties of the Norwegian version of the Safety Attitudes Questionnaire (SAQ), Generic version (Short Form 2006). *BMC Health Services Research* 8 (1), 191.

Deming, W. E. (1986) Out of the Crisis: Quality. *Productivity and Competitive Position, Massachusetts, USA*.

DiCuccio, M. H. (2015) The Relationship Between Patient Safety Culture and Patient Outcomes: A Systematic Review. *Journal of Patient Safety* 11 (3), 135-42.

Draper, M., Cohen, P. and Buchan, H. (2001) Seeking consumer views: what use are results of hospital patient satisfaction surveys? *International Journal for Quality in Health Care* 13 (6), 463-468.

Draycott, T., Sibanda, T., Laxton, C., Winter, C., Mahmood, T. and Fox, R. (2010) Quality improvement demands quality measurement. *BJOG: An International Journal of Obstetrics & Gynaecology* 117 (13), 1571-1574.

Drykorn, O. A., Kristoffersen, M. and Walberg, M. (2012) Reducing post-caesarean surgical wound infection rate: an improvement project in a Norwegian maternity clinic. *BMJ Quality & Safety* 21 (3), 206-210.

Duclos, A. and Voirin, N. (2010) The p-control chart: a tool for care improvement. *International Journal for Quality in Health Care* 22 (5), 402-407.

Dupont, C., Occelli, P., Deneux-Tharaux, C., Touzet, S., Duclos, A., Bouvier-Colle, M.-H., Rudigoz, R.-C. and Huissoud, C. (2014) Severe postpartum haemorrhage after vaginal delivery: a statistical process control chart to report seven years of continuous quality improvement. *European Journal Of Obstetrics, Gynecology, And Reproductive Biology* 178, 169-175.

Edmondson, A. C. (2004) Learning from failure in health care: frequent opportunities, pervasive barriers. *Quality and Safety in Health Care* 13 (suppl 2), ii3-ii9.

Eisenberg, E. M., Murphy, A. G., Sutcliffe, K., Wears, R., Schenkel, S., Perry, S. and Vanderhoef, M. (2005) Communication in emergency medicine: implications for patient safety. *Communication monographs* 72 (4), 390-413.

Elsous, A., Akbari Sari, A., Rashidian, A., Aljeesh, Y., Radwan, M. and AbuZaydeh, H. (2016) A cross-sectional study to assess the patient safety culture in the Palestinian hospitals: a baseline assessment for quality improvement. *JRSM Open* 7 (12), 2054270416675235.

Eriksen, M. B. and Frandsen, T. F. (2018) The impact of patient, intervention, comparison, outcome (PICO) as a search strategy tool on literature search quality: a systematic review. *Journal of the Medical Library Association : JMLA* 106 (4), 420-431.

Escuriet, R., White, J., Beeckman, K., Frith, L., Leon-Larios, F., Loytved, C., Luyben, A., Sinclair, M. and van Teijlingen, E. (2015) Assessing the performance of maternity care in Europe: a critical exploration of tools and indicators. *BMC Health Services Research* 15 (1), 491.

Excel (2010) Microsoft Excel 2010.

Field, A. (2013) *Discovering statistics using IBM SPSS statistics.* sage.

Finstad, K. (2010) Response interpolation and scale sensitivity: Evidence against 5-point scales. *Journal of Usability Studies* 5 (3), 104-110.

Fisher, M. J. and Marshall, A. P. (2009) Understanding descriptive statistics. *Australian Critical Care* 22 (2), 93-97.

Freeth, D., Sandall, J., Allan, T., Warburton, F., Berridge, E. J., Mackintosh, N., Rogers, M. and Abbott, S. (2012) A methodological study to compare survey-based and observation-based evaluations of organisational and safety cultures and then compare both approaches with markers of the quality of care. *Health Technology Assessment* 16 (25), iii-iv, 1-184.

Frøslie, K. F., Godang, K., Bollerslev, J., Henriksen, T., Røislien, J., Veierød, M. B. and Qvigstad, E. (2011) Correction of an unexpected increasing trend in glucose measurements during 7 years recruitment to a cohort study. *Clinical Biochemistry* 44 (17-18), 1483-1486.

Fujita, S., Seto, K., Kitazawa, T., Matsumoto, K. and Hasegawa, T. (2014) Characteristics of unit-level patient safety culture in hospitals in Japan: a cross-sectional study. *BMC Health Services Research* 14, 508-508.

Gabrani, J. C. M., Knibb, W. P., Petrela, E. M. D. P., Hoxha, A. M. D. P. and Gabrani, A. M. D. P. (2016) Provider Perspectives on Safety in Primary Care in Albania. *Journal of Nursing Scholarship* 48 (6), 552-560.

Gardner, G., Gardner, A. and O'connell, J. (2014) Using the Donabedian framework to examine the quality and safety of nursing service innovation. *Journal of clinical nursing* 23 (1-2), 145-155.

Geary, M., Fanagan, M. and Boylan, P. (1997) Maternal satisfaction with management in labour and preference for mode of delivery. *J Perinat Med* 25 (5), 433-9.

Ghag, K., Winter, C., Bahl, R., Lynch, M., Lenguerrand, E. and Draycott, T. (2018) A multi-centre study evaluating the impact of multi-professional obstetric emergencies training on staff safety attitudes and unit culture. *International Journal of Obstetrics and Gynaecology* 125, 155-156.

Ghobashi, M. and Khandekar, R. (2008) Satisfaction among Expectant Mothers with Antenatal Care Services in the Musandam Region of Oman. *Sultan Qaboos University Medical Journal* 8 (3), 325-332.

Gibberd, R., Hancock, S., Howley, P. and Richards, K. (2004) Using indicators to quantify the potential to improve the quality of health care. *Int J Qual Health Care* 16 Suppl 1, i37-43.

Gillespie, B. M., Harbeck, E., Kang, E., Steel, C., Fairweather, N., Panuwatwanich, K. and Chaboyer, W. (2017) Effects of a Brief Team Training Program on Surgical Teams' Nontechnical Skills: An Interrupted Time-Series Study. *Journal Of Patient Safety*.

Goodman, P., Mackey, M. C. and Tavakoli, A. S. (2004) Factors related to childbirth satisfaction. *Journal of Advanced Nursing* 46 (2), 212-219.

Gray, D. E. (2006) *Doing research in the real world.* Taylor & Francis.

Grober, E. D. and Bohnen, J. M. A. (2005) Defining medical error. *Canadian journal of surgery. Journal canadien de chirurgie* 48 (1), 39-44.

Groome, L. J. (2010) Decreasing extremes in patient waiting time. *Quality Management in Health Care* 19 (2).

Groome, L. J., Esters, F. T. and Carter, S. G. (2009) Bundling unbundled charges: a case study in an academic obstetrical practice. *The Journal Of Medical Practice Management: MPM* 24 (6), 367-371.

Groves, P. S. (2014) The Relationship Between Safety Culture and Patient Outcomes: Results From Pilot Meta-Analyses. *Western Journal of Nursing Research* 36 (1), 66-83.

Groves, P. S., Meisenbach, R. J. and Scott-Cawiezell, J. (2011) Keeping patients safe in healthcare organizations: a structuration theory of safety culture. *Journal Of Advanced Nursing* 67 (8), 1846-1855.

Gude, W. T., van Engen-Verheul, M. M., van der Veer, S. N., de Keizer, N. F. and Peek, N. (2016) How does audit and feedback influence intentions of health professionals to improve practice? A laboratory experiment and field study in cardiac rehabilitation. *BMJ Quality & Safety*.

Guittier, M.-J., Cedraschi, C., Jamei, N., Boulvain, M. and Guillemin, F. (2014) Impact of mode of delivery on the birth experience in first-time mothers: a qualitative study. *BMC Pregnancy and Childbirth* 14, 254.

Guldenmund, F. W. (2000) The nature of safety culture: a review of theory and research. *Safety Science* 34 (1–3), 215-257.

Gungor, I. and Beji, N. K. (2012) Development and psychometric testing of the scales for measuring maternal satisfaction in normal and caesarean birth. *Midwifery* 28 (3), 348-357.

Gupta, M. and Kaplan, H. C. (2017) Using Statistical Process Control to Drive Improvement in Neonatal Care: A Practical Introduction to Control Charts. *Clinics In Perinatology* 44 (3), 627-644.

Haller, G., Garnerin, P., Morales, M. A., Pfister, R., Berner, M., Irion, O., Clergue, F. and Kern, C. (2008) Effect of crew resource management training in a multidisciplinary obstetrical setting. *International Journal for Quality in Health Care* 20 (4), 254-263 10p.

Halligan, M. and Zecevic, A. (2011) Safety culture in healthcare: a review of concepts, dimensions, measures and progress. *BMJ Quality & Safety* 20 (4), 338-343.

Hamdan, M. and Saleem, A. A. o. (2013) Assessment of patient safety culture in Palestinian public hospitals. *International Journal for Quality in Health Care* 25 (2), 167-175.

Haq, M. (2015) A Comparative Analysis of Qualitative and Quantitative Research Methods and a Justification for Adopting Mixed Methods in Social Research.

Harrits, G. S. (2011) More Than Method?: A Discussion of Paradigm Differences Within Mixed Methods Research. *Journal of Mixed Methods Research* 5 (2), 150-166.

Harvey, S., Rach, D., Stainton, M. C., Jarrell, J. and Brant, R. (2002) Evaluation of satisfaction with midwifery care. *Midwifery* 18 (4), 260-267.

Hasan, M. N. (2014) Positivism: to what extent does it aid our understanding of the contemporary social world? *Quality & Quantity*, 1-9.

Hodnett, E. D. (2002) Pain and women's satisfaction with the experience of childbirth: A systematic review. *American Journal of Obstetrics and Gynecology* 186 (5), S160-S172.

Hollesen, R. v. B., Johansen, R. L. R., Rørbye, C., Munk, L., Barker, P. and Kjaerbye-Thygesen, A. (2018) Successfully reducing newborn asphyxia in the labour unit in a large academic medical centre: a quality improvement project using statistical process control. *BMJ Quality & Safety* 27 (8), 633-642.

Hooper, D., Coughlan, J. and Mullen, M. (2008) Structural equation modelling: Guidelines for determining model fit. *Articles*, 2.

Hughes Driscoll, C. A., Schub, J. A., Pollard, K. and El-Metwally, D. (2017) A Wireless Text Messaging System Improves Communication for Neonatal Resuscitation. *American Journal of Medical Quality* 32 (3), 307-312.

Hussein, S., Dahlen, H. G., Ogunsiji, O. and Schmied, V. (2018) Women's experiences of childbirth in Middle Eastern countries: A narrative review. *Midwifery* 59, 100-111.

Hysong, S. J., Kell, H. J., Petersen, L. A., Campbell, B. A. and Trautner, B. W. (2016) Theory-based and evidence-based design of audit and feedback programmes: examples from two clinical intervention studies. *BMJ Quality & Safety*.

Illingworth, J. (2014) Developing and testing a framework to measure and monitor safety in healthcare. *Clinical risk* 20 (3), 64-68.

Institute of Medicine (2001) *Crossing the quality chasm: a new health system for 21st century.* Washington DC: National Academy Press.

Ivers, N. M., Grimshaw, J. M., Jamtvedt, G., Flottorp, S., O'Brien, M. A., French, S. D., Young, J. and Odgaard-Jensen, J. (2014) Growing Literature, Stagnant Science? Systematic Review, Meta-Regression and Cumulative Analysis of Audit and Feedback Interventions in Health Care. *Journal of General Internal Medicine* 29 (11), 1534-1541.

Jahlan, I., Plummer, V., McIntyre, M. and Moawed, S. (2016) What women have to say about giving birth in Saudi Arabia. *Middle East Journal of Nursing* 101 (3031), 1-9.

Jamtvedt, G., Young, J. M., Kristoffersen, D. T., O'Brien, M. A. and Oxman, A. D. (2006) Does telling people what they have been doing change what they do? A systematic review of the effects of audit and feedback. *Quality & Safety in Health Care* 15 (6), 433-436.

Jha, P., Larsson, M., Christensson, K. and Skoog Svanberg, A. (2017) Satisfaction with childbirth services provided in public health facilities: results from a cross- sectional survey among postnatal women in Chhattisgarh, India. *Global Health Action* 10 (1), 1386932.

Jiang, K., Tian, L., Yan, C., Li, Y., Fang, H., Peihang, S., Li, P., Jia, H., Wang, Y. and Kang, Z. (2019) A cross-sectional survey on patient safety culture in secondary hospitals of Northeast China. *PloS one* 14 (3), e0213055.

Johnson, M. P., Kim, S. J., Langstraat, C. L., Jain, S., Habermann, E. B., Wentink, J. E., Grubbs, P. L., Nehring, S. A., Weaver, A. L., McGree, M. E., Cima, R. R., Dowdy, S. C. and Bakkum-Gamez, J. N. (2016) Using Bundled Interventions to Reduce Surgical Site Infection After Major Gynecologic Cancer Surgery. *Obstetrics And Gynecology* 127 (6), 1135-1144.

Johnson, R. B. and Onwuegbuzie, A. J. (2004) Mixed Methods Research: A Research Paradigm Whose Time Has Come. *Educational Researcher* 33 (7), 14-26.

Johnson, R. B., Onwuegbuzie, A. J. and Turner, L. A. (2007) Toward a Definition of Mixed Methods Research. *Journal of Mixed Methods Research* 1 (2), 112-133.

Johnston, G., Crombie, I. K., Alder, E. M., Davies, H. T. O. and Millard, A. (2000) Reviewing audit: barriers and facilitating factors for effective clinical audit. *Quality in Health Care* 9 (1), 23-36.

Jurdi, R. and Khawaja, M. (2004) Caesarean section rates in the Arab region: a cross-national study. *Health policy and planning* 19 (2), 101-110.

K Loganathan, P., Nair, V., Vine, M., Kostecky, L., Kowal, D. and Soraisham, A. (2017) Quality Improvement Study on New Endotracheal Tube Securing Device (Neobar) in Neonates. *Indian Journal Of Pediatrics* 84 (1), 20-24.

Kabakian-Khasholian, T., Bashour, H., El-Nemer, A., Kharouf, M., Sheikha, S., El Lakany, N., Barakat, R., Elsheikh, O., Nameh, N., Chahine, R. and Portela, A. (2017) Women's satisfaction and perception of control in childbirth in three Arab countries. *Reproductive Health Matters* 25 (sup1), 16-26.

Kagawa-Singer, M., Padilla, G. V. and Ashing-Giwa, K. (2010) Health-Related Quality of Life and Culture. *Seminars in Oncology Nursing* 26 (1), 59-67.

Kamath, B. D., Donovan, E. F., Christopher, R., Brodbeck, J., Slone, C. and Marcotte, M. P. (2012) Using improvement science to increase accuracy and reliability of gestational age documentation. *American Journal Of Perinatology* 29 (3), 217-224.

Kamil, A. and Khorshid, E. (2013) Maternal perceptions of antenatal care provision at a tertiary level hospital, riyadh. *Oman Medical Journal* 28 (1), 33-35.

Kapila, D., Letchworth, P., Duffy, S., Anderson, M., Jackson, J. and Bayer, A. S. (2017) Multidisciplinary Obstetric and Midwifery Simulation Course (MOMs): 6 years of commitment to training. *International Journal of Obstetrics and Gynaecology* 124 ((Kapila D.) Imperial Medical School, London, United Kingdom), 190.

Kaur, V., Saini, K. and Walia, I. (2009) Development of Birth Preparedness Tool (BPT)-A tool to assess other's preparedness for delivery, postnatal and new born care. *Nursing and Midwifery Research Journal* 5 (2).

Kazmi, T., Saiseema, S. t. and Khan, S. (2012) Analysis of Cesarean Section Rate - According to Robson's 10-group Classification. *Oman medical journal* 27 (5), 415-417.

Keefe, M. J., Loda, J. B., Elhabashy, A. E. and Woodall, W. H. (2017) Improved implementation of the risk-adjusted Bernoulli CUSUM chart to monitor surgical outcome quality. *International Journal for Quality in Health Care* 29 (3), 343-348.

Kempe, A., Noor-Aldin Alwazer, F. A. and Theorell, T. (2010) Women's authority during childbirth and Safe Motherhood in Yemen. *Sexual & Reproductive Healthcare* 1 (4), 129-134.

Khresheh, R. (2010) Support in the first stage of labour from a female relative: the first step in improving the quality of maternity services. *Midwifery* 26 (6), e21-e24.

Khresheh, R., Almalik, M., Owies, A. and Barclay, L. (2018) Implementation of a childbirth preparation program in the maternal and child health centres in Jordan. *Midwifery* 61, 1-7.

Kim, L. Y. (2014) *The Effects of Simulation-based TeamSTEPPS Interprofessional Communication and Teamwork Training on Patient and Provider Outcomes*. Ph.D. University of California, Los Angeles. http://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=109774748&site=ehost-live Accessed 12 April 2018.

Koetsier, A., van der Veer, S. N., Jager, K. J., Peek, N. and de Keizer, N. F. (2012) Control charts in healthcare quality improvement. A systematic review on adherence to methodological criteria. *Methods of information in medicine* 51 (3), 189.

Kohn, L. T., Corrigan, J. M. and Donaldson, M. S. (2000) *To Err is Human: Building a Safer Health System.* Washington (DC): National Academies Press (US)

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Kristensen, H. and Hounsgaard, L. (2014) Evaluating the Impact of Audits and Feedback as Methods for Implementation of Evidence in Stroke Rehabilitation. *The British Journal of Occupational Therapy* 77 (5), 251-259.

Künzle, B., Kolbe, M. and Grote, G. (2010) Ensuring patient safety through effective leadership behaviour: A literature review. *Safety Science* 48 (1), 1-17.

Lane, S., Weeks, A., Scholefield, H. and Alfirevic, Z. (2007) Monitoring obstetricians' performance with statistical process control charts. *BJOG: An International Journal of Obstetrics & Gynaecology* 114 (5), 614-618.

Langer, A., Villar, J., Romero, M., Nigenda, G., Piaggio, G., Kuchaisit, C., Rojas, G., Al-Osimi, M., Belizán, J. M., Farnot, U., Al-Mazrou, Y., Carroli, G., Ba'aqeel, H., Lumbigano, P., Pinol, A., Bergsjö, P., Bakketeig, L., Garcia, J. and Berendes, H. (2002) Are women and providers satisfied with antenatal care? Views on a standard and a simplified, evidence-based model of care in four developing countries. *BMC Women's Health* 2 (1).

Lavery, J. P., Brown, J. E. and Filbey, M. E. (2014) Changing culture for patient safety. *Obstetrics and Gynecology* 123, 24S.

Le Coze, J. C. (2019) How safety culture can make us think. *Safety Science* 118, 221-229.

Lekoudis, E. and West, K. (2018) Risk management with simulation training: A match made in heaven! *International Journal of Obstetrics and Gynaecology* 125, 168.

Lendahls, L. and Oscarsson, M. G. (2017) Midwifery students' experiences of simulation- and skills training. *Nurse Education Today* 50, 12-16.

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A., Clarke, M., Devereaux, P. J., Kleijnen, J. and Moher, D. (2009) The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and ElaborationPRISMA: Explanation and Elaboration. *Annals of Internal Medicine* 151 (4), W-65.

Linder-Pelz, S. and Struening, E. L. (1985) The multidimensionality of patient satisfaction with a clinic visit. *Journal of Community Health* 10 (1), 42-54.

Long, A. F., Godfrey, M., Randall, T., Brettle, A. and Grant, M. (2002) *HCPRDU Evaluation tool for mixed methods studies*. Leeds, University of Leeds, Nuffield Institute for Health.

Lucas, P. J., Baird, J., Arai, L., Law, C. and Roberts, H. M. (2007) Worked examples of alternative methods for the synthesis of qualitative and quantitative research in systematic reviews. *BMC Medical Research Methodology* 7 (1), 4.

Luxembourg, A., Kjaer, S. K., Nygard, M., Ellison, M. C., Group, T., Marshall, J. B., Radley, D. and Saah, A. (2017) Design of a long-term follow-up effectiveness, immunogenicity and safety study of

women who received the 9-valent human papillomavirus vaccine. *Contemporary Clinical Trials* 52, 54-61.

Maneesriwongul, W. and Dixon, J. K. (2004) Instrument translation process: a methods review. *Journal of Advanced Nursing* 48 (2), 175-186.

Maqsood, A. S. A., Oweis, A. I. and Hasna, F. S. (2012) Differences between patients' expectations and satisfaction with nursing care in a private hospital in Jordan. *International Journal of Nursing Practice* 18 (2), 140-146.

Marang-van de Mheen, P. J., van Duijn-Bakker, N. and Kievit, J. (2007) Surgical adverse outcomes and patients' evaluation of quality of care: inherent risk or reduced quality of care? *Quality & safety in health care* 16 (6), 428-433.

Martijn, L., Harmsen, M., Gaal, S., Mettes, D., van Dulmen, S. and Wensing, M. (2013) Are health professionals' perceptions of patient safety related to figures on safety incidents? *Journal Of Evaluation In Clinical Practice* 19 (5), 944-947.

Marzolf, S., Zekarias, B., Tedla, K., Woldeyesus, D. E., Sereke, D., Yohannes, A., Asrat, K. and Weaver, M. R. (2015) Continuing professional education in Eritrea taught by local obstetrics and gynaecology residents: Effects on work environment and patient outcomes. *Global Public Health* 10 (8), 980-994.

Mathew, M., Kumari, R., Vaclavinkova, V. and Krolikowski, A. (2002) Caesarean sections at Sultan Qaboos University Hospital: A three year review. *Journal for scientific research. Medical sciences* 4 (1-2), 29-32.

McColl, E., Jacoby, A., Thomas, L., Soutter, J. and Bamford, C. (2002) Design and use of questionnaires: a review of best practice applicable to surveys of health service staff and patients. *Health Technology Assessment* 5 (31), 256.

McCusker, K. and Gunaydin, S. (2015) Research using qualitative, quantitative or mixed methods and choice based on the research. *Perfusion* 30 (7), 537-542.

McQuaid-Hanson, E. and Pian-Smith, M. C. M. (2017) Huddles and Debriefings: Improving Communication on Labor and Delivery. *Anesthesiology Clinics* 35 (1), 59-67.

Mduma, E. R., Ersdal, H., Kvaloy, J. T., Svensen, E., Mdoe, P., Perlman, J., Kidanto, H. L. and Soreide, E. (2018) Using statistical process control methods to trace small changes in perinatal mortality after a training program in a low-resource setting. *International Journal For Quality In Health Care: Journal Of The International Society For Quality In Health Care* 30 (4), 271-275.

Meakin, R. and Weinman, J. (2002) The 'Medical Interview Satisfaction Scale' (MISS-21) adapted for British general practice. *Family Practice* 19 (3), 257-263.

Miller, K. K., Riley, W., Davis, S. and Hansen, H. E. (2008) In situ simulation: a method of experiential learning to promote safety and team behavior. *Journal of Perinatal & Neonatal Nursing* 22 (2), 105-113 9p.

Miller, S. A. and Forrest, J. L. (2001) Enhancing your practice through evidence-based decision making: PICO, learning how to ask good questions. *Journal of Evidence Based Dental Practice* 1 (2), 136-141.

Milne, J. K., Bendaly, N., Bendaly, L., Worsley, J., Fitzgerald, J. and Nisker, J. (2010) A measurement tool to assess culture change regarding patient safety in hospital obstetrical units. *Journal Of Obstetrics And Gynaecology Canada* 32 (6), 590-597.

MoH (2014) *Health Vision 2050: The Main Document.* Sultanate of Oman: *https://www.moh.gov.om/documents/16506/119833/Health+Vision+2050/7b6f40f3-8f93-4397-9fde-34e04026b829*

MoH (2015a) *Annual Health Report.* Sultanate of Oman:

MoH (2015b) *Situational Analysis Of Maternal Services In Sohar Hospital.*

MoH (2017) *Annual Health Report.* Saltanate of Oman:

Mohammad, K. I., Alafi, K. K., Mohammad, A. I., Gamble, J. and Creedy, D. (2013) Jordanian women's dissatisfaction with childbirth care. *International Nursing Review* 61 (2), 278-284.

Mohammed, M. A. (2004) Using statistical process control to improve the quality of health care. *Quality and Safety in Health Care* 13 (4), 243-245.

Mohammed, M. A., Booth, K., Marshall, D., Brolly, M., Marshall, T., Cheng, K.-K., Hayes, M. and Fitzpatrick, S. (2005) A practical method for monitoring general practice mortality in the UK: findings from a pilot study in a health board of Northern Ireland. *British journal of general practice* 55 (518), 670-676.

Mohammed, M. A., Cheng, K. K., Rouse, A. and Marshall, T. (2001) Bristol, Shipman, and clinical governance: Shewhart's forgotten lessons. *The Lancet* 357 (9254), 463-467.

Mohammed, M. A. and Laney, D. (2006) Overdispersion in health care performance data: Laney's approach. *Quality and Safety in Health Care* 15 (5), 383-384.

Mohammed, M. A., Worthington, P. and Woodall, W. H. (2008) Plotting basic control charts: tutorial notes for healthcare practitioners. *Quality and Safety in Health Care* 17 (2), 137-145.

Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G. and The, P. G. (2009) Preferred reporting items for systematic reviews and meta-analyses: the PRISMA Statement. *Open Medicine* 3 (3), e123-e130.

Monazea, E. M. M. and Al-Attar, G. S. T. (2015) Quality of delivery care in Assiut University Hospital, Egypt: mothers' satisfaction. *The Journal Of The Egyptian Public Health Association* 90 (2), 64-71.

Morello, R. T., Lowthian, J. A., Barker, A. L., McGinnes, R., Dunt, D. and Brand, C. (2013) Strategies for improving patient safety culture in hospitals: a systematic review. *BMJ Quality & Safety* 22 (1), 11-18.

Mosallam, M., Rizk, D. E. E., Thomas, L. and Ezimokhai, M. (2004) Women's attitudes towards psychosocial support in labour in United Arab Emirates. *Archives Of Gynecology And Obstetrics* 269 (3), 181-187.

Moss, S., Mitchell, M. and Casey, V. (2017) Creating a Culture of Success: Using the Magnet Recognition Program® as a Framework to Engage Nurses in an Australian Healthcare Facility. *The Journal Of Nursing Administration* 47 (2), 116-122.

Moudi, Z. and Tavousi, M. (2016) Evaluation of Mackey Childbirth Satisfaction Rating Scale in Iran: What Are the Psychometric Properties? *Nursing and Midwifery Studies* 5 (2).

Mukhtar-Yola, M., Audu, L. I., Olaniyan, O., Akinbi, H. T., Dawodu, A. and Donovan, E. F. (2018) Decreasing birth asphyxia: utility of statistical process control in a low-resource setting. *BMJ Open Quality* 7 (3), e000231-e000231.

Murphy, H. J., Cahill, J. B., Twombley, K. E., Annibale, D. J. and Kiger, J. R. (2018) Implementing a practice change: early initiation of continuous renal replacement therapy during neonatal extracorporeal life support standardizes care and improves short-term outcomes. *Journal Of Artificial Organs: The Official Journal Of The Japanese Society For Artificial Organs* 21 (1), 76-85.

Murray, M., Sundin, D. and Cope, V. (2018) The nexus of nursing leadership and a culture of safer patient care. *Journal Of Clinical Nursing* 27 (5-6), 1287-1293.

Nassar, A. H., Awwad, J., Khalil, A. M., Abu-Musa, A., Mehio, G. and Usta, I. M. (2007) A randomised comparison of patient satisfaction with vaginal and sublingual misoprostol for induction of labour at term. *BJOG: An International Journal Of Obstetrics And Gynaecology* 114 (10), 1215-1221.

Nathan, A. T. and Kaplan, H. C. (2017) Tools and methods for quality improvement and patient safety in perinatal care. *Seminars In Perinatology* 41 (3), 142-150.

Nicolay, C., Purkayastha, S., Greenhalgh, A., Benn, J., Chaturvedi, S., Phillips, N. and Darzi, A. (2012) Systematic review of the application of quality improvement methodologies from the manufacturing industry to surgical healthcare. *British Journal of Surgery* 99 (3), 324-335.

Nieva, V. F. and Sorra, J. (2003) Safety culture assessment: a tool for improving patient safety in healthcare organizations. *Quality and Safety in Health Care* 12 (suppl 2), ii17.

O'Brien, P. A. and Pillai, S. (2017) Uterine perforation by intrauterine devices: A 16-year review. *Journal of Family Planning and Reproductive Health Care* 43 (4), 289-295.

Ogunyemi, D., McGlynn, S., Ronk, A., Knudsen, P., Andrews-Johnson, T., Raczkiewicz, A., Jovanovski, A., Kaur, S., Dykowski, M., Redman, M. and Bahado-Singh, R. (2018) Using a multifaceted quality improvement initiative to reverse the rising trend of cesarean births. *Journal of Maternal-Fetal & Neonatal Medicine* 31 (5), 567-579.

Oweis, A. (2009) Jordanian mother's report of their childbirth experience: Findings from a questionnaire survey. *International Journal of Nursing Practice* 15 (6), 525-533.

Oza-Frank, R., Kachoria, R., Dail, J., Green, J., Walls, K. and McClead, R. E., Jr. (2017) A Quality Improvement Project to Decrease Human Milk Errors in the NICU. *Pediatrics* 139 (2).

Pae, C.-U. (2015) Why Systematic Review rather than Narrative Review? *Psychiatry investigation* 12 (3), 417-419.

Pallant, J. (2013) *SPSS survival manual.* McGraw-Hill Education (UK).

Papanna, R., Biau, D. J., Mann, L. K., Johnson, A. and Moise Jr, K. J. (2011) Use of the Learning Curve–Cumulative Summation test for quantitative and individualized assessment of competency of a surgical procedure in obstetrics and gynecology: fetoscopic laser ablation as a model. *American Journal of Obstetrics and Gynecology* 204 (3), 218.e1-218.e9.

Parand, A., Benn, J., Burnett, S., Pinto, A. and Vincent, C. (2012) Strategies for sustaining a quality improvement collaborative and its patient safety gains. *Int J Qual Health Care* 24 (4), 380-90.

Pawson, R., Greenhalgh, T., Harvey, G. and Walshe, K. (2005) Realist review - a new method of systematic review designed for complex policy interventions. *Journal of Health Services Research & Policy* 10 (1_suppl), 21-34.

Peeters, S. H. P., van Zwet, E. W., Oepkes, D. and et al. (2014) Learning curve for fetoscopic laser surgery using cumulative sum analysis. *Acta Obstetricia et Gynecologica Scandinavica* 93 (7), 705-711.

Perla, R. J., Provost, L. P. and Murray, S. K. (2011) The run chart: a simple analytical tool for learning from variation in healthcare processes. *BMJ Quality & Safety* 20 (1), 46-51.

Perriman, N. and Davis, D. (2016) Measuring maternal satisfaction with maternity care: A systematic integrative review: What is the most appropriate, reliable and valid tool that can be used to measure maternal satisfaction with continuity of maternity care? *Women and Birth* 29 (3), 293-299.

Pettker, C. M., Thung, S. F., Norwitz, E. R., Buhimschi, C. S., Raab, C. A., Copel, J. A., Kuczynski, E., Lockwood, C. J. and Funai, E. F. (2009) Impact of a comprehensive patient safety strategy on obstetric adverse events. *American Journal of Obstetrics & Gynecology* 200 (5), 492.e1-8 1p.

Pettker, C. M., Thung, S. F., Raab, C. A., Donohue, K. P., Copel, J. A., Lockwood, C. J. and Funai, E. F. (2011) A comprehensive obstetrics patient safety program improves safety climate and culture. *American Journal of Obstetrics & Gynecology* 204 (3), 216.e1-6 1p.

Pöchhacker, F. (2006) Research and methodology in healthcare interpreting. *Linguistica Antverpiensia, New Series–Themes in Translation Studies* (5).

Popay, J., Roberts, H., Sowden, A., Petticrew, M., Arai, L., Rodgers, M., Britten, N., Roen, K. and Duffy, S. (2006) Guidance on the conduct of narrative synthesis in systematic reviews. *A product from the ESRC methods programme Version* 1, b92.

Prairie, B. A. and Foster, T. (2010) Improving prenatal HIV screening with tailored educational interventions: an approach to guideline implementation. *Quality & Safety In Health Care* 19 (6), e52-e52.

Pratt, S. D., Mann, S., Salisbury, M., Greenberg, P., Marcus, R., Stabile, B., McNamee, P., Nielsen, P. and Sachs, B. P. (2007) Patient Safety and Quality Awards. Impact of CRM-based team training on obstetric outcomes and clinicians' patient safety attitudes. *Joint Commission Journal on Quality & Patient Safety* 33 (12), 720-725 6p.

Provost, L. P. and Murray, S. (2011) *The health care data guide: learning from data for improvement.* John Wiley & Sons.

Raab, C. A., Will, S. E., Richards, S. L. and et al. (2013) The effect of collaboration on obstetric patient safety in three academic facilities. *JOGNN: Journal of Obstetric, Gynecologic and Neonatal Nursing* 42 (5), 606-616.

Raftopoulos, V., Savva, N. and Papadopoulou, M. (2011) Safety Culture in the Maternity Units: a census survey using the Safety Attitudes Questionnaire. *BMC Health Services Research* 11 (1), 238-238 1p.

Rasmussen, T. B., Ulrichsen, S. P. and Nørgaard, M. (2018) Use of risk-adjusted CUSUM charts to monitor 30-day mortality in Danish hospitals. *Clinical epidemiology* 10, 445-456.

Ravi, R. and Filani, T. O. (2002) Patient satisfaction of the Obstetric and Gynecology Unit at King Khalid University Hospital, Riyadh, Kingdom of Saudi Arabia. *Saudi Medical Journal* 23 (1).

Reynolds, M., Jheeta, S., Benn, J., Sanghera, I., Jacklin, A., Ingle, D. and Franklin, B. D. (2016) Improving feedback on junior doctors' prescribing errors: mixed-methods evaluation of a quality improvement project. *BMJ Quality & Safety*.

Ridelberg, M., Roback, K. and Nilsen, P. (2014) Facilitators and barriers influencing patient safety in Swedish hospitals: a qualitative study of nurses' perceptions. *BMC Nursing* 13, 23-23.

Riley, W. and Davis, S. (2011) Didactic and simulation nontechnical skills team training to improve perinatal patient outcomes in a community hospital. *Joint Commission Journal on Quality and Patient Safety* 37 (8), 357-364.

Riley, W., Davis, S., Miller, K., Hansen, H., Sainfort, F. and Sweet, R. (2011) Didactic and simulation nontechnical skills team training to improve perinatal patient outcomes in a community hospital. *Joint Commission Journal on Quality and Patient Safety* 37 (8), 357-364.

Rizk, D. E., Nasser, M., Thomas, L. and Ezimokhai, M. (2001) Women's perceptions and experiences of childbirth in United Arab Emirates. *Journal Of Perinatal Medicine* 29 (4), 298-307.

Rizk, D. E. E., El-Zubeir, M. A., Al-Dhaheri, A. M., Al-Mansouri, F. R. and Al-Jenaibi, H. S. (2005) Determinants of women's choice of their obstetrician and gynecologist provider in the UAE. *Acta Obstetricia Et Gynecologica Scandinavica* 84 (1), 48-53.

Robinson, S. N. (2014) *Monitoring hospital safety climate using control charts of non-harm events in reporting systems*. Clemson University.

Robson, M. S. (2001) Can we reduce the caesarean section rate? *Best Pract Res Clin Obstet Gynaecol* 15 (1), 179-94.

Robson, S. J. and de Costa, C. M. (2017) Thirty years of the World Health Organization's target caesarean section rate: time to move on. *Medical Journal of Australia* 206 (4), 181-185.

Rochester, N. T., Banach, L. P., Hoffner, W., Zeltser, D., Lewis, P., Seelbach, E. and Cuzzi, S. (2018) Facilitating the timely discharge of well newborns by using quality improvement methods. *Pediatrics* 141 (5).

Rodwell, M. K. (1990) Person/environment construct: Positivist versus naturalist, dilemma or opportunity for health social work research and practice? *Social Science & Medicine* 31 (1), 27-34.

Runciman, W., Hibbert, P., Thomson, R., Van Der Schaaf, T., Sherman, H. and Lewalle, P. (2009) Towards an International Classification for Patient Safety: key concepts and terms. *International Journal for Quality in Health Care* 21 (1), 18-26.

Runciman, W. B. (2006) Shared meanings: preferred terms and definitions for safety and quality concepts. *Medical Journal of Australia* 184 (10), S41.

S. Alayed, A., Lööf, H. and Johansson, U.-B. (2014) Saudi Arabian ICU safety culture and nurses' attitudes. *International Journal of Health Care Quality Assurance* 27 (7), 581-93.

Saary, M. J. (2008) Radar plots: a useful way for presenting multivariate health care data. *J Clin Epidemiol* 61 (4), 311-317.

Sasikumar, R. and Devi, S. B. (2014) Cumulative sum charts and its healthcare applications; a systematic review. *Sri Lankan Journal of Applied Statistics* 15 (1).

Saunders, M., Lewis, P. and Thornhill, A. (2007) Research methods. *Business Students 4th edition Pearson Education Limited, England*.

Sawyer, A., Ayers, S., Abbott, J., Gyte, G., Rabe, H. and Duley, L. (2013) Measures of satisfaction with care during labour and birth: a comparative review. *BMC Pregnancy and Childbirth* 13 (108).

Sexton, J. B., Helmreich, R. L., Neilands, T. B., Rowan, K., Vella, K., Boyden, J., Roberts, P. R. and Thomas, E. J. (2006) The Safety Attitudes Questionnaire: psychometric properties, benchmarking data, and emerging research. *BMC health services research* 6 (1), 44.

Sexton, J. B., Thomas, E.J. and Grillo, S.P. (2003) *The Safety Attitudes Questionnaire (SAQ) Guidelines for Administration.* The University of Texas Center of Excellence for Patient Safety Research and Practice.

Shaban, I., Mohammad, K. and Homer, C. (2016) Development and Validation of Women's Satisfaction With Hospital-Based Intrapartum Care Scale in Jordan. *Journal of Transcultural Nursing* 27 (3), 256-261.

Shabila, N. P., Ahmed, H. M. and Yasin, M. Y. (2014) Women's views and experiences of antenatal care in Iraq: a Q methodology study. *BMC Pregnancy And Childbirth* 14 (43).

Shabila, N. P., Ahmed, H. M. and Yasin, M. Y. (2015) Assessment of women's perspectives and experiences of childbirth and postnatal care using Q-methodology. *Eastern Mediterranean Health Journal* 21 (9), 647-654.

Shekelle, P. G., Pronovost, P. J., Wachter, R. M. and et al. (2013) THe top patient safety strategies that can be encouraged for adoption now. *Annals of Internal Medicine* 158 (5_Part_2), 365-368.

Shoushtarian, M., Barnett, M., McMahon, F. and et al. (2014) Impact of introducing Practical Obstetric Multi-Professional Training (PROMPT) into maternity units in Victoria, Australia. *BJOG* 121 (13), 1710-18.

Siassakos, D., Clark, J., Sibanda, T., Attilakos, G., Jefferys, A., Cullen, L., Bisson, D. and Draycott, T. (2009) A simple tool to measure patient perceptions of operative birth. *BJOG: An International Journal of Obstetrics & Gynaecology* 116 (13), 1755-1761.

Siassakos, D., Draycott, T. J., Crofts, J. F. and et al. (2010) More to teamwork than knowledge, skill and attitude. *BJOG* 117 (10), 1262-69.

Siassakos, D., Fox, R., Hunt, L., Farey, J., Laxton, C., Winter, C. and Draycott, T. (2011) Attitudes toward safety and teamwork in a maternity unit with embedded team training. *American Journal of Medical Quality* 26 (2), 132-137 6p.

Sibanda, N. (2016) Graphical model-based O/E control chart for monitoring multiple outcomes from a multi-stage healthcare procedure. *Statistical Methods In Medical Research* 25 (5), 2274-2293.

Sibanda, T. and Sibanda, N. (2007a) The CUSUM chart method as a tool for continuous monitoring of clinical outcomes using routinely collected data. *BMC Medical Research Methodology* 7, 46-46.

Sibanda, T. and Sibanda, N. (2007b) The CUSUM chart method as a tool for continuous monitoring of clinical outcomes using routinely collected data. *BMC Medical Research Methodology* 7 (1), 46.

Simpson, K. R., Knox, G. E., Martin, M., George, C. and Watson, S. R. (2011) Michigan Health & Hospital Association Keystone Obstetrics: A Statewide Collaborative for Perinatal Patient Safety in Michigan. *Joint Commission Journal on Quality & Patient Safety* 37 (12), 544-552 9p.

Singla, A. K., Kitch, B. T., Weissman, J. S. and Campbell, E. G. (2006) Assessing Patient Safety Culture: A Review and Synthesis of the Measurement Tools. *Journal of Patient Safety* 2 (3), 105-115.

Sinni, S. V., Cross, W. M., Swanson, A. E. and Wallace, E. M. (2016) Measuring pregnancy care: towards better maternal and child health. *Australian and New Zealand Journal of Obstetrics and Gynaecology*.

Sinni, S. V., Wallace, E. M. and Cross, W. M. (2011) Patient safety: a literature review to inform an evaluation of a maternity service. *Midwifery* 27 (6), e274-8.

Sirriyeh, R., Lawton, R., Armitage, G., Gardner, P. and Ferguson, S. (2012) Safety subcultures in health-care organizations and managing medical error. *Health services management research* 25 (1), 16-23.

Sitzia, J. and Wood, N. (1997) Patient satisfaction: a review of issues and concepts. *Social science & medicine* 45 (12), 1829-1843.

Skjeggestad, E., Norvoll, R., Sandal, G. M. and Gulbrandsen, P. (2017) How do international medical graduates and colleagues perceive and deal with difficulties in everyday collaboration? A qualitative study. *Scandinavian Journal Of Public Health* 45 (4), 428-435.

Smith, D. R., Muto, T., Sairenchi, T., Ishikawa, Y., Sayama, S., Yoshida, A. and Townley-Jones, M. (2011) Examining the dimensions of hospital safety climate and psychosocial risk factors among Japanese nurses. *Journal of Transcultural Nursing* 22 (3), 257-264.

Smits, M., Wagner, C., Spreeuwenberg, P. and et al. (2009) Measuring patient safety culture: an assessment of the clustering of responses at unit level and hospital level. *Qual Saf Health Care* 18, 292-296.

Snilstveit, B., Oliver, S. and Vojtkova, M. (2012) Narrative approaches to systematic review and synthesis of evidence for international development policy and practice. *Journal of Development Effectiveness* 4 (3), 409-429.

Sørensen, J. L., Van der Vleuten, C., Lindschou, J., Gluud, C., Ostergaard, D., Leblanc, V., Johansen, M., Ekelund, K., Albrechtsen, C. K., Pedersen, B. W., Kjærgaard, H., Weikop, P. and Ottesen, B. (2013) 'In situ simulation' versus 'off site simulation' in obstetric emergencies and their effect on knowledge, safety attitudes, team performance, stress, and motivation: study protocol for a randomized controlled trial. *Trials* 14 (1), 220-220 1p.

Sørensen, J. L., van der Vleuten, C., Rosthøj, S., Østergaard, D., LeBlanc, V., Johansen, M., Ekelund, K., Starkopf, L., Lindschou, J., Gluud, C., Weikop, P. and Ottesen, B. (2015) Simulation-based multiprofessional obstetric anaesthesia training conducted in situ versus off-site leads to similar individual and team outcomes: a randomised educational trial. *BMJ Open* 5 (10).

Souza, J. P., Betran, A. P., Dumont, A., De Mucio, B., Gibbs Pickens, C. M., Deneux-Tharaux, C., Ortiz-Panozo, E., Sullivan, E., Ota, E., Togoobaatar, G., Carroli, G., Knight, H., Zhang, J., Cecatti, J. G., Vogel, J. P., Jayaratne, K., Leal, M. C., Gissler, M., Morisaki, N., Lack, N., Oladapo, O. T., Tunçalp, Ö., Lumbiganon, P., Mori, R., Quintana, S., Costa Passos, A. D., Marcolin, A. C., Zongo, A., Blondel, B., Hernández, B., Hogue, C. J., Prunet, C., Landman, C., Ochir, C., Cuesta, C., Pileggi-Castro, C., Walker, D., Alves, D., Abalos, E., Moises, E. C. D., Vieira, E. M., Duarte, G., Perdona, G., Gurol-Urganci, I., Takahiko, K., Moscovici, L., Campodonico, L., Oliveira-Ciabati, L., Laopaiboon, M., Danansuriya, M., Nakamura-Pereira, M., Costa, M. L., Torloni, M. R., Kramer, M. R., Borges, P., Olkhanud, P. B., Pérez-Cuevas, R., Agampodi, S. B., Mittal, S., Serruya, S., Bataglia, V., Li, Z., Temmerman, M. and Gülmezoglu, A. M. (2016) A global reference for caesarean section rates (C-Model): A multicountry cross-sectional study. *BJOG: An International Journal of Obstetrics and Gynaecology* 123 (3), 427-436.

Spaich, S., Welzel, G., Berlit, S., Temerinac, D., Tuschy, B., Sütterlin, M. and Kehl, S. (2013) Mode of delivery and its influence on women's satisfaction with childbirth. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 170 (2), 401-406.

Srivastava, A., Avan, B. I., Rajbangshi, P. and Bhattacharyya, S. (2015) Determinants of women's satisfaction with maternal health care: a review of literature from developing countries. *BMC Pregnancy and Childbirth* 15 (1), 97.

StataCorp (2015) *Stata Statistical Software*. 13.1 edition. College Station, Texas 77845 USA: StataCorp LP.

Suman, G. and Prajapati, D. (2018) Control chart applications in healthcare: a literature review. *International Journal of Metrology and Quality Engineering* 9, 5.

Sylvanus, N. R. and Eyak, W. U. (2017) Unhealthy environment and attitude to its adversity. *Journal of Perinatal Medicine* 45, 572.

Takahashi, M. (2016) The distinctive characteristics of the hourly distribution of live births on specific days in Japan. *Environmental Health And Preventive Medicine* 21 (6), 501-522.

Taljaard, M., Donner, A., Villar, J. and et al. (2009) Understanding the factors associated with differences in caesarean section rates at hospital level: the case of Latin America. 23 (6), 574-581.

Tennant, R., Mohammed, M. A., Coleman, J. J. and Martin, U. (2007) Monitoring patients using control charts: a systematic review. *International Journal for Quality in Health Care* 19 (4), 187-194.

Tesfaye, S., Barry, D., Gobezayehu, A. G., Frew, A. H., Stover, K. E., Tessema, H., Alamineh, L. and Sibley, L. M. (2014) Improving Coverage of Postnatal Care in Rural Ethiopia Using A Community-based, Collaborative Quality Improvement Approach. *Journal of Midwifery & Women's Health* 59, S55-64.

Thakkar, K., Gilchrist, M., Dickinson, E., Benn, J., Franklin, B. D. and Jacklin, A. (2011) A quality improvement programme to increase compliance with an anti-infective prescribing policy. *J Antimicrob Chemother* 66 (8), 1916-20.

Thakur, A., Kler, N., Garg, P., Singh, A. and Gandhi, P. (2018) Impact of Quality Improvement Program on Expressed Breastmilk Usage in Very Low Birth Weight Infants. *Indian Pediatrics* 55 (9), 739-743.

Thor, J., Lundberg, J., Ask, J., Olsson, J., Carli, C., Harenstam, K. P. and Brommels, M. (2007) Application of statistical process control in healthcare improvement: systematic review. *Qual Saf Health Care* 16 (5), 387-99.

Ting, W.-H., Peng, F.-S., Lin, H.-H. and Hsiao, S.-M. (2017) The impact of situation-background-assessment-recommendation (SBAR) on safety attitudes in the obstetrics department. *Taiwanese Journal Of Obstetrics & Gynecology* 56 (2), 171-174.

Tirelli, M. A. and Colpa-Lewis, C. (2017) Nurse-Led Debriefing to Create a Culture of Safety Following Obstetric Emergencies. *JOGNN: Journal of Obstetric, Gynecologic & Neonatal Nursing* 46, S2-S2.

Twijnstra, A. R. H., Blikkendaal, M. D., Driessen, S. R. C., van Zwet, E. W., de Kroon, C. D. and Jansen, F. W. (2014) Tailor-made proficiency curves in laparoscopic hysterectomy: enhancing patient safety using CUSUM analysis. *Gynecological Surgery* 11 (4), 235-240.

UN, G. A. (2015) *Transforming our World: The 2030 Agenda for Sustainable Development.* A/RES/70/1, 21 October.

van Noord, I., de Bruijne, M. C. and Twisk, J. W. R. (2010) The relationship between patient safety culture and the implementation of organizational patient safety defences at emergency departments. *International Journal for Quality in Health Care* 22 (3), 162-169.

van Teijlingen, E. R., Hundley, V., Rennie, A.-M., Graham, W. and Fitzmaurice, A. (2003) Maternity Satisfaction Studies and Their Limitations: "What Is, Must Still Be Best". *Birth* 30 (2), 75-82.

Varkey, P., Reller, M. K. and Resar, R. K. (2007) Basics of Quality Improvement in Health Care. *Mayo Clinic Proceedings* 82 (6), 735-739.

Verbakel, N., Van Melle, M. and Langelaan, M. (2014) Exploring patient safety culture in primary care. *International Journal for Quality in Health Care* 26 (6), 585-591.

Verbakel, N. J., Zwart, D. L. M., Langelaan, M., Verheij, T. J. M. and Wagner, C. (2013) Measuring safety culture in Dutch primary care: psychometric characteristics of the SCOPE-PC questionnaire. *BMC Health Services Research* 13, 354-354.

Vincent, C. (2010) *Patient safety.* 2nd edition. Chichester, UK: Wiley-Blackwell.

Vincent, C., Burnett, S. and Carthey, J. (2013) *The measurement and monitoring of safety: drawing together academic evidence and practical experience to produce a framework for safety measurement and monitoring.* The Health Foundation.

Vincent, C., Burnett, S. and Carthey, J. (2014) Safety measurement and monitoring in healthcare: a framework to guide clinical teams and healthcare organisations in maintaining safety. *BMJ Qual Saf* 23 (8), 670-677.

Vlayen, A., Schrooten, W., Wami, W., Aerts, M., Barrado, L. G., Claes, N. and Hellings, J. (2015) Variability of patient safety culture in Belgian acute hospitals. *Journal Of Patient Safety* 11 (2), 110-121.

Wagner, B., Meirowitz, N., Shah, J., Nanda, D., Reggio, L., Cohen, P., Britt, K., Kaufman, L., Walia, R., Bacote, C., Lesser, M. L., Pekmezaris, R., Fleischer, A. and Abrams, K. J. (2012) Comprehensive Perinatal Safety Initiative to Reduce Adverse Obstetric Events. *Journal for Healthcare Quality: Promoting Excellence in Healthcare* 34 (1), 6-15 10p.

Wagner, C., Smits, M., Sorra, J. and Huang, C. C. (2013) Assessing patient safety culture in hospitals across countries. *International journal for quality in health care : journal of the International Society for Quality in Health Care* 25 (3), 213-221.

Wagner, L. M., Brush, B. L., Castle, N. G. and et al. (2017) Nursing home patient safety culture perceptions among US and immigrant nurses. *J Patient Saf* [Epub ahead of print].

Walker, C. L., Merriam, A. A., Ohuma, E. O., Dighe, M. K., Gale, M., Rajagopal, L., Papageorghiou, A. T., Gyamfi-Bannerman, C. and Adams Waldorf, K. M. (2018) Femur-sparing pattern of abnormal fetal growth in pregnant women from New York City after maternal Zika virus infection. *American Journal of Obstetrics and Gynecology* 219 (2), 187.e1-187.e20.

Ward, M. E., De Brún, A., Beirne, D., Conway, C., Cunningham, U., English, A., Fitzsimons, J., Furlong, E., Kane, Y., Kelly, A., McDonnell, S., McGinley, S., Monaghan, B., Myler, A., Nolan, E., O'Donovan, R., O'Shea, M., Shuhaiber, A. and McAuliffe, E. (2018) Using Co-Design to Develop a Collective Leadership Intervention for Healthcare Teams to Improve Safety Culture. *International Journal Of Environmental Research And Public Health* 15 (6).

Ware, J. E., Jr., Snyder, M. K., Wright, W. R. and Davies, A. R. (1983) Defining and measuring patient satisfaction with medical care. *Eval Program Plann* 6 (3-4), 247-263.

Ware, J. L., Schetzina, K. E., Morad, A., Barker, B., Scott, T. A. and Grubb, P. H. (2018) A Statewide Quality Improvement Collaborative to Increase Breastfeeding Rates in Tennessee. *Breastfeeding Medicine* 13 (4), 292-300.

Warschauer, M., Said, G. R. E. and Zohry, A. G. (2002) Language choice online: Globalization and identity in Egypt. *Journal of Computer-Mediated Communication* 7 (4), JCMC744.

Weaver, S. J., Lubomksi, L. H., Wilson, R. F., Pfoh, E. R., Martinez, K. A. and Dy, S. M. (2013a) Promoting a culture of safety as a patient safety strategy: a systematic review. *Annals of internal medicine* 158 (5 Pt 2), 369-374.

Weaver, S. J., Lubomksi, L. H., Wilson, R. F., Pfoh, E. R., Martinez, K. A. and Dy, S. M. (2013b) Promoting a culture of safety as a patient safety strategy: A systematic review. *Annals of Internal Medicine* 158 (5_Part_2), 369-374.

Westat, R., Joann Sorra, Laura Gray, Suzanne Streagle, Theresa Famolaro, Naomi Yount, Jessica Behm, (2016) *AHRQ Hospital Survey on Patient Safety Culture: User's Guide. (Prepared by Westat, under Contract No. HHSA290201300003C). AHRQ Publication No. 15-0049-EF (Replaces 04-0041). Rockville, MD: Agency for Healthcare Research and Quality. January 2016.* http://www.ahrq.gov/professionals/quality-patient-safety/patientsafetyculture/hospital/index.html.

WHO (2010) *Conceptual framework for the international classification for patient safety version 1.1: final technical report January 2009.* World Health Organization. 606940937X.

WHO (2015) *Trends in Maternal Mortality: 1990 to 2015 estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division.* Geneva.

World Health Organization (2006) Birth and emergency preparedness in antenatal care: Integrated management of pregnancy and childbirth (IMPAC). *Geneva, Swaziland: WHO Department of Making Pregnancy Safer*.

World Health Organization (2016) *WRH: Proportion of caesarean sections of all deliveries by country*. 2016 edition.

Worldatlas (2018) *Arabic Speaking Countries.* https://www.worldatlas.com/articles/arabic-speaking-countries.html Accessed 6th August.

Ye, J., Zhang, J., Mikolajczyk, R., Torloni, M. R., Gülmezoglu, A. M. and Betran, A. P. (2016) Association between rates of caesarean section and maternal and neonatal mortality in the 21st century: a worldwide population-based ecological study with longitudinal data. *BJOG : an international journal of obstetrics and gynaecology* 123 (5), 745-753.

Ye, X. M., Gbadamosi, J., Bayer, A. S., Jackson, J., Anderson, M., Letchworth, P., Kapila, D. and Duffy, S. (2018) Improving clinical outcomes and communication through multidisciplinary obstetric and midwifery simulation. *International Journal of Obstetrics and Gynaecology* 125, 187.

Yi, M. and Jezewski, M. A. (2000) Korean nurses' adjustment to hospitals in the United States of America. *J Adv Nurs* 32 (3), 721-9.

Zhu, X., Wholey, D. R., Cain, C. and Natafgi, N. (2017) Staff Turnover in Assertive Community Treatment (Act) Teams: The Role of Team Climate. *Administration and Policy in Mental Health and Mental Health Services Research* 44 (2), 258-268.

Appendices

Appendix 1: CEMB critical appraisal tool of cross-sectional studies (first review: Safety culture in maternity)

	Clearly focused question?	**Research method (study design) appropriate?**	**Method of selection of the subjects clearly described?**	**The way sample was obtained may introduce bias?**	**Sample of subjects representative?**	**Sample size based on pre-study considerations of statistical power?**	**Satisfactory response rate achieved?**	**Measurements (questionnaires) likely to be valid and reliable?**	**Statistical significance assessed?**	**Confidence intervals given for the main results?**	**Total Yes**
(Ackenbom et al. 2014)	Y	Y	Y	N	Y	C	Y	C	Y	N	6/10
(Burke et al. 2013)	Y	Y	N	Y	C	C	Y	Y	Y	N	6/10
(Channing et al. 2015)	Y	Y	C	Y	Y	C	Y	Y	C	C	6/10
(Fujita et al. 2014)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9/10
(Haller et al. 2008)	Y	Y	Y	Y	C	C	Y	Y	Y	Y	8/10
(Lavery et al. 2014)	Y	Y	C	Y	C	C	Y	C	Y	N	5/10
(Martijn et al. 2013)	Y	Y	Y	N	Y	C	Y	Y	Y	Y	8/10
(Marzolf et al. 2015)	Y	Y	C	C	Y	C	Y	Y	Y	Y	7/10
(Miller et al. 2008)	Y	Y	N	Y	C	C	C	Y	N	N	4/10
(Pettker et al. 2009)	Y	Y	Y	N	Y	Y	C	Y	N	N	6/10
(Pettker et al. 2011)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9/10
(Pratt et al. 2007)	Y	Y	N	Y	C	C	C	Y	N	N	4/10
(Raab et al. 2013)	Y	Y	Y	N	Y	Y	Y	Y	N	N	7/10
(Raftopoulos et al. 2011)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9/10
(Riley et al. 2011)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9/10
(Shoushtarian et al. 2014)	Y	Y	Y	N	Y	Y	N	Y	Y	Y	8/10
(Siassakos et al. 2010)	Y	Y	Y	C	Y	C	Y	Y	Y	Y	8/10
(Siassakos et al. 2011)	Y	Y	Y	N	Y	C	Y	Y	Y	Y	8/10
(Simpson et al. 2011)	Y	Y	C	C	C	C	C	Y	N	N	3/10
(Sørensen et al. 2013)	Y	Y	Y	N	Y	C	C	Y	N	N	5/10
(Verbakel et al. 2014)	Y	Y	Y	Y	Y	C	N	Y	Y	Y	8/10
(Verbakel et al. 2013)	Y	Y	Y	N	C	C	Y	Y	Y	Y	7/10
(Wagner et al. 2012)	Y	Y	Y	Y	C	C	Y	Y	Y	Y	8/10

Y: Yes, **N:** No, **C:** Can't tell

Appendix 2: CASP tool for the qualitative studies (first review: safety culture in maternity)

Author	**Clear statement of the aims?**	**Qualitative methodology appropriate?**	**Research design appropriate to address the aims?**	**Recruitment strategy appropriate to the aims?**	**Data collected in a way that addressed the research issue?**	**Relationship between researcher and participants adequately considered?**	**Ethical issues considered?**	**Data analysis sufficiently rigorous?**	**Clear statement of findings?**	**Total Yes**
(Abbott et al. 2012)	Yes	Yes	Yes	Can't tell	Yes	Yes	Yes	Can't tell	Yes	7/9
(Currie 2009)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	8/9

Appendix 3: The HCPRDU evaluation tool for the mixed methods studies (first review: safety culture in maternity)

Review Area			
1. Study Evaluative Overview			
Author, title, source (publisher and place of publication) and year	(Allen et al. 2010)	(Freeth et al. 2012)	(Milne et al. 2010)
What are the aims of this paper?	To reports a case study examining the safety culture and considers the benefits of using surveys and interviews to understand safety culture.	To compare contrasting methods of assessing culture, and to compare each with an assessment of the quality of care	To develop a cultural assessment survey (CAS) to assess patient safety culture change
What are the key findings?	Safety culture warrant improvement , qualitative interview provided a deeper understanding of factors influencing safety culture, it is beneficial to include qualitative methods when study safety culture	Surveys elicit variable response rates and that safety-related facets of teamwork can be observed and scored	The CAS may enable obstetrical units to assess change in patient safety culture
What are the strengths and weaknesses of the study and theory, policy and practice implications?	Its main strengths is its practical implication for studying safety culture by concluding that qualitative methods are very useful when combined with quantitative methods.	Its main strength is that safety culture was assessed using three methods: surveys, observations and audits.	The main strength is the high reliability of the developed questionnaire but it might be of limited use.
2. Study And Context (Setting, Sample And Outcome Measurement)			
What type of study is this?	A descriptive case study	Ethnographic study	Methodological study
What was the intervention?	No intervention	No intervention	No intervention
What was the comparison intervention?	There was no intervention but they compared between quantitative (survey) and qualitative (interviews) in studying safety culture	The compared between surveys and observations in assessing patient safety culture.	Not applicable
Is there sufficient detail given of the nature of the intervention and the comparison intervention?	Not applicable	Not applicable	Not applicable
What is the relationship of the study to the area of the topic review?	The study has examined safety culture in maternity which is the topic and area being reviewed	The study focused on safety culture in maternity units which is under the scope of this review.	The study focused on safety culture in Obstetric which is with the scope of the our review
a. Context: Setting			
Within what geographical and care setting is the study carried out?	One maternity service in Australia	Delivery unit and emergency department in UK	Obstetric units in Canada
What is the rationale for choosing this setting?	Strong desire and high opportunity to improve the safety of an important service in health care.	Concerns about avoidable harms to users in these priority areas.	The need to assess an existing training program.
Is the setting appropriate and/or sufficiently specific for examination of the research question?	Yes	Yes	Yes
Is sufficient detail given about the setting?	Yes	Yes	Yes

Over what time period is the study conducted?	Not clearly outlined	6 days of the week	12 months
b. Context II: Sample			
What was the source population?	Maternity health professionals	Staff working in maternity and emergency departments	Nurses and physicians of Obstetric units
What were the inclusion criteria?	Professionals working full time and part time	All staff of the included departments	Hospitals involved in the training program
What were the exclusion criteria?	Non- Maternity professionals	students and members of staff who had joined the department < 4 weeks before the survey was distributed	Not clearly outlined
How was the sample (events, persons, times and settings) selected?	Participants for the survey were selected using staff rosters while the interview participants were selected purposively.	They were selected team lead based on the above criteria	All hospitals implementing the program were invited
Is the sample (informants, settings and events) appropriate to the aims of the study?	Yes	Yes	Yes
If there was more than one group of subjects, how many groups were there, and how many people were in each group?	Two groups, the survey participants (in the two sites) were 59 and the interview groups were 15	The survey participants were 531 and the 31 observation hours	143 participants in the initial phase and 220 in the following phase
Is the achieved sample size sufficient for the study aims and to warrant the conclusions drawn?	The survey participants response was less than 60% which is not in line with the recommendation. The interview group, the number can be considered to be sufficient.	No. The overall response rate was 27% for the survey which is below the recommended rate.	Response rate was 47% in the initial phase and 62% in the following phase
c. Context III: Outcome Measurement			
What outcome criteria were used in the study?	No outcome criteria were pre-defined	Examination of feasibility, correlation and agreement	Reliability test
Whose perspectives are addressed (professional, service, user, carer)?	Professional	Professionals and service	Professionals (physician and nurses)
Is there sufficient breadth and depth?	Yes	Yes	Yes
Ethics			
Was Ethical Committee approval obtained?	Yes	Yes	Yes
Was informed consent obtained from participants of the study?	Yes	Yes. Multisite research ethics approval	Yes
How have ethical issues been adequately addressed?	Not applicable	Observation were made within major injuries and minor injuries sections but not in the resuscitation and pediatric sections	Not applicable
3. Group Comparability			
If there was more than one group was analysed, were the groups comparable before the intervention?	Not applicable	Not applicable	Not applicable

In what respects were they comparable and in what were they not?			
How were important confounding variables controlled (e.g. matching, randomization, or in the analysis stage)?			
Was this control adequate to justify the author's conclusions?			
Were there other important confounding variables controlled for in the study design or analyses and what were they?			
Did the authors take these into account in their interpretation of the findings?			
4. Qualitative Data Collection And Analysis			
What data collection methods were used in the study?	Two types of data were collected quantitatively using a well validated survey and qualitatively using interviews.	Survey data were collected using the SCS tool while qualitative data were collected using observations and audits of clinical markers	Data were collected through literature review, surveys, interviews and focus group
Is the process of fieldwork adequately described?	Yes	Yes	Yes
5. Data Analysis			
How were the data analysed?	Quantitative data were analysed descriptively while the qualitative data were analysed using Template analysis and were further checked by two other researchers.	The survey data were analysed using descriptive statistics, multilevel modeling and correlations.	Means and internal consistencies were assessed using Cronbach's alpha
How adequate is the description of the data analysis?	The data analysis was described with good details.	Many details were provided.	Fairly adequate
Is adequate evidence provided to support the analysis?	Examples were given on how the qualitative data were analsysed but the raw data was not presented.	Yes. The tool used to collect and analyse data were included in the appendices	Yes. Details were provided about the different items of the questionnaire and it analysis
Are the findings interpreted within the context of other studies and theory?	Yes. Their findings were compared to other studies where only quantitative methods were used.	Yes. The have related their finding to the hypothesis and other studies examining safety culture.	Not clearly outlined but concluded that the tool can be used to measure safety culture in other settings.
6. Researcher's Potential Bias			
What was the researcher's role?	The main researcher was the interviewer.	The researchers played several roles including data collection and data analysis.	Interviewer
Are the researcher's own position, assumptions and possible biases outlined?	This was not clearly described in the paper	Yes.	Not clearly outlined

Appendix 4: Search strategy used in Medline and applied to other databases (second review: Interventions to improve safety culture)

#	Query	Results
S21	S11 AND S16 AND S19 (limit to Journal article, English language)	2,767
S20	S11 AND S16 AND S19	2,899
S19	S17 OR S18	446,143
S18	"patient safety"	29,080
S17	"safety"	446,143
S16	S12 OR S13 OR S14 OR S15	2,194,841
S15	"behavior*"	1,182,717
S14	"attitude*"	349,418
S13	"climate"	76,622
S12	"culture"	714,657
S11	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10	1,221,897
S10	"pregnancy"	846,587
S9	"antenatal"	27,958
S8	"postnatal"	91,562
S7	"perinatal"	69,024
S6	"midwif*"	37,362
S5	"reproductive care"	268
S4	"reproductive health service*"	2,359
S3	"gyn*cology"	251,779
S2	"obstetric*"	353,191
S1	"matern*"	299,442

Appendix 5: CEMB critical appraisal tool of cross-sectional studies (second review: Interventions to improve safety culture)

	Focused question?	Research method appropriate?	Subjects selection method clearly described?	The way the sample was obtained may introduce bias?	Sample of subjects representative?	Sample size based on considerations of statistical power?	Satisfactory response rate?	Surveys valid and reliable?	Statistical significance assessed?	Confidence intervals given?	Total Yes
(Burke et al. 2013)	Y	Y	N	Y	C	C	Y	Y	Y	N	6/10
(Haller et al. 2008)	Y	Y	Y	Y	C	C	Y	Y	Y	Y	8/10
(Marzolf et al. 2015)	Y	Y	C	C	Y	C	Y	Y	Y	Y	7/10
(Miller et al. 2008)	Y	Y	N	Y	C	C	C	Y	N	N	4/10
(Pettker et al. 2011)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9/10
(Pratt et al. 2007)	Y	Y	N	Y	C	C	C	Y	N	N	4/10
(Raab et al. 2013)	Y	Y	Y	N	Y	Y	Y	Y	N	N	7/10
(Riley et al. 2011)	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	9/10
(Shoushtarian et al. 2014)	Y	Y	Y	N	Y	Y	N	Y	Y	Y	8/10
(Simpson et al. 2011)	Y	Y	C	C	C	C	C	Y	N	N	3/10
(Wagner et al. 2012)	Y	Y	Y	Y	C	C	Y	Y	Y	Y	8/10

Y= Yes, N = No, C = Can't tell

Appendix 6: Excluded papers (second review: Interventions to improve safety culture)

Author	**Reason for exclusion**
(Abbott et al. 2012)	No intervention
(Abiri 2017)	Dissertation
(Ackenbom et al. 2014)	Poster paper
(Albolino et al. 2018)	PSC not measured before and after
(Allen et al. 2010)	No intervention
(Amaya Arias et al. 2016)	Poster presentation
(Ansari et al. 2018)	Poster presentation
(Athwal et al. 2018)	Poster presentation
(Bahl et al. 2018)	Poster presentation
(Baig and Shahid 2017)	Conference paper
(Basude et al. 2018)	Poster presentation
(Blumenthal et al. 2017)	Poster Abstract
(Carmouche 2017)	Dissertation
(Carneiro de Azevedo et al. 2016)	PSC was not measured
(Channing et al. 2015)	Conference paper
(Cordell et al. 2018)	Poster presentation
(Currie 2009)	No intervention
(Freeth et al. 2012)	No intervention
(Fujita et al. 2014)	No intervention
(Ghag et al. 2018)	Poster presentation
(Kapila et al. 2017)	Poster presentation
(Lavery et al. 2014)	Poster paper
(Lekoudis and West 2018)	Poster presentation
(Lendahls and Oscarsson 2017)	PSC not measure before and after
(Martijn et al. 2013)	No intervention
(McQuaid-Hanson and Pian-Smith 2017)	No intervention used
(Milne et al. 2010)	No intervention
(Moss et al. 2017)	Not specific to maternity
(Murray et al. 2018)	Not specific to maternity
(Pettker et al. 2009)	Duplicate study
(Raftopoulos et al. 2011)	No intervention
(Siassakos et al. 2010)	PSC before and after intervention not reported
(Siassakos et al. 2011)	PSC before and after intervention not reported
(Sørensen et al. 2015)	PSC was compared between two groups of intervention but not before and after
(Sylvanus and Eyak 2017)	Poster Abstract
(Ting et al. 2017)	Not specific to maternity
(Tirelli and Colpa-Lewis 2017)	Conference paper
(Verbakel et al. 2013)	No intervention
(Verbakel et al. 2014)	No intervention
(Ward et al. 2018)	Not specific to maternity
(Ye et al. 2018)	Poster presentation

Appendix 7: Excluded studies and reasons for exclusion (third review: patient satisfaction in maternity)

Author	Why excluded
(Awadalla et al. 2009)	Not specific to satisfaction about childbirth care
(Benage et al. 2015)	Not specific to satisfaction about childbirth care
(Bougmiza et al. 2011)	Not specific to satisfaction about childbirth care
(Ghobashi and Khandekar 2008)	Not specific to satisfaction about childbirth care
(Kamil and Khorshid 2013)	Not specific to satisfaction about childbirth care
(Kempe et al. 2010)	Women authority not satisfaction
(Khresheh 2010)	No survey used
(Khresheh et al. 2018)	No survey used
(Langer et al. 2002)	Not specific to satisfaction about childbirth care
(Maqsood et al. 2012)	Not specific to childbirth. All specialities were included
(Monazea and Al-Attar 2015)	Full text was not accessible
(Nassar et al. 2007)	Focus on labour pain not overall experience
(Ravi and Filani 2002)	A letter to the editor
(Rizk et al. 2005)	Not specific to satisfaction about childbirth care
(Shabila et al. 2014)	No survey used
(Shabila et al. 2015)	No survey used

Appendix 8: Excluded articles and reason for exclusion (fourth review: control chart in maternity)

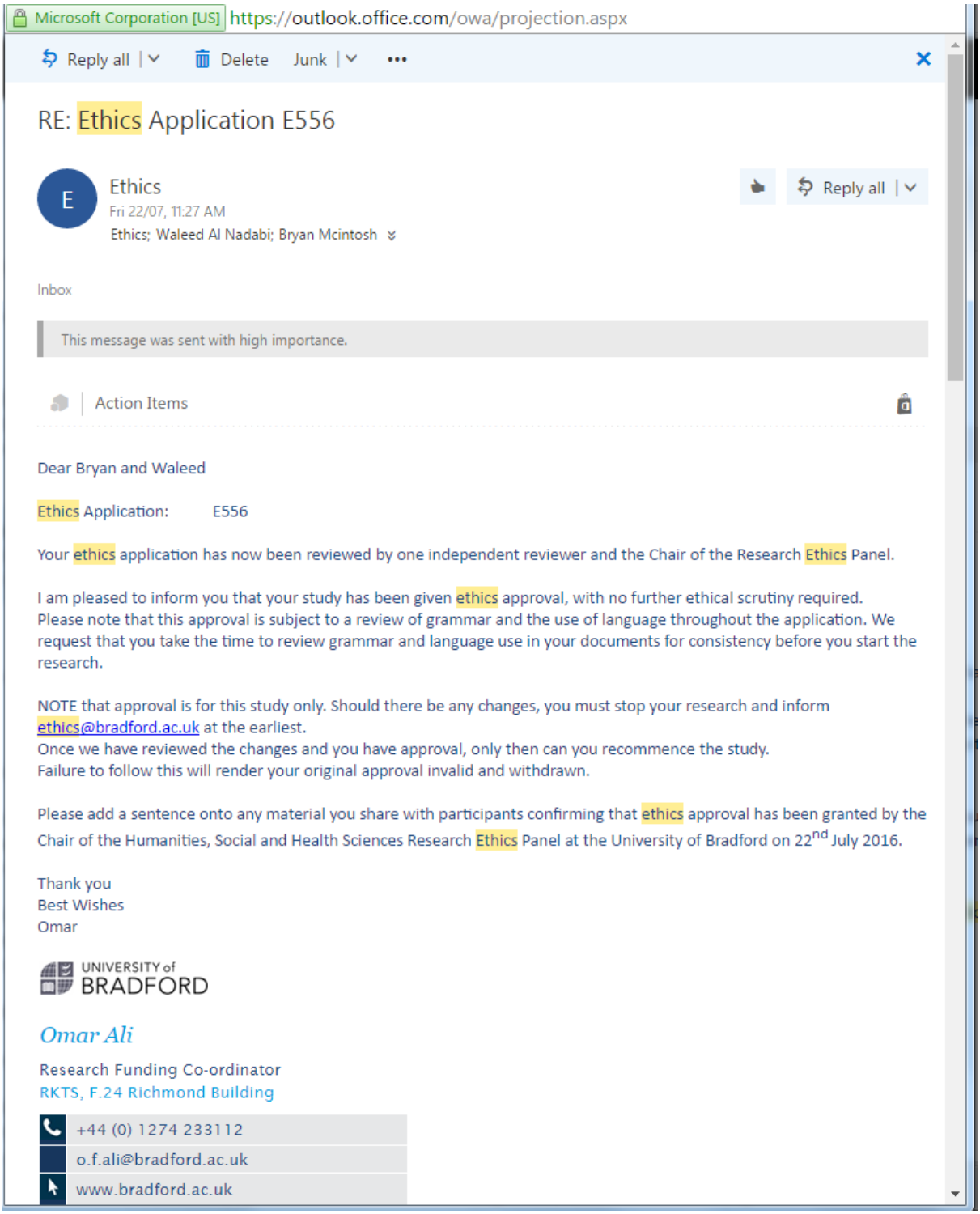
Author	**Reason for exclusion**
(Andrews et al. 2018)	Not related to maternity service
(Antón et al. 2018)	Control charts not used
(Britto et al. 2018)	Not specific to maternity
(Chiriboga et al. 2018)	Not specific to maternity
(Gillespie et al. 2017)	Not specific to maternity
(Gupta and Kaplan 2017)	Not specific to maternity
(Hughes Driscoll et al. 2017)	Not specific to maternity
(K Loganathan et al. 2017)	Not specific to maternity
(Luxembourg et al. 2017)	Covered women but not specific to maternity
(Murphy et al. 2018)	Not specific to maternity
(Nathan and Kaplan 2017)	Reviews improvement methods and concepts
(Ogunyemi et al. 2018)	Full text not accessible
(Oza-Frank et al. 2017)	Not specific to maternity
(Rochester et al. 2018)	Not specific to maternity
(Thakur et al. 2018)	Not specific to maternity
(Walker et al. 2018)	Control chart not used
(Ware et al. 2018)	Full text not accessible
(Sibanda 2016)	Discussing concepts and theory of control charts

Appendix 9: Perceptions about the application of SPC charts in maternity units (fourth review: SPC in maternity)

Author	Perception and feedback	Challenges/limitations
Baghurst (2013)	CUSUM charts address the concern of clinicians who are dismissive of the traditional single indicators for comparing hospitals and clinicians	The accuracy of data is not always possible to ensure. Data might be distorted by underreporting or over reporting once detection improves. Risk adjusted modelling has its own limitation.
Balsyte et al. (2010)	CUCUM is a promising method for routing clinical application. It allowed for early detection of easily missed errors. It may be useful for other sonographic assessments.	The number of measurements used might not have been enough for accurate evaluation.
Boe et al. (2009)	SPC CHARTS can inform decision makers on whether changes are needed and whether process redesign/ reengineering is required. They are useful in a public health setting.	It usually does not involve the use of control groups. Further application of SPC CHARTS in public health programs is needed before generalising its usefulness.
Chang et al. (1979)	SPC CHARTS provides a visual view of repeated measurements and give objective criteria for defining abnormality.	SPC CHARTS makes no assumption regarding the causal relationship.
Comas et al. (2011)	CUSUM has the advantage of early detection of deviation compared with other tools.	
Drykorn et al. (2012)	A control chart is a powerful, efficient, and simple tool for monitoring	There are few publications about its application in infection control.
Dupont et al. (2014)	Control chart allowed easy visualization and provided early warning for exceeding thresholds. It was easy to enter data and to be set up in Excel file. It provided an interesting communication tool for professionals.	The control limits were set up at 1 SD from the mean which made a chance of 50% chance to a false alarm compared to 27.7% if it was set up at 2 SD
Groome (2010)	SPC c allowed a better understanding of variation and whether the process was successfully improved.	SPC CHARTS (x bar and S) were constructed assuming the variable (waiting time) was normally distributed which might not be real.
Groome et al. (2009)	SPC CHARTS provided visual and statistically rigorous basis for monitoring improvement after improvement initiatives	Knowing that there was a problem was not enough to correct the problem.
Kamath et al. (2012)	Run charts enabled the follow up of trends of improvement over time: during initiation, modification, and intensification of the improvement project.	
Lane et al. (2007)	SPC CHARTS can be used as a basis for continuous monitoring and improvement. They provided a better alternative to league tables.	If the process being measured is not frequently performed, control limits may need to be reduced.
Peeters et al. (2014)	The CUSUM chart proved to be feasible and highly insightful for continuous monitoring of individual performance. It has enabled real-time evaluation and prevents delays in corrective actions compared to other statistical methods.	Case selection (accuracy of data) may have biased the CUSUM chart results. Setting the threshold for acceptable and non-acceptable levels was difficult. It was based on literature-guided expert levels. But historical data could have the advantage of having comparable case-mix.

Author	Perception and feedback	Challenges/limitations
Sibanda and Sibanda (2007a)	CUSUM charts provided a visual presentation of trends, formal continuous evaluation, and can be used to monitor outcomes using routinely collected data. They work better than other tools like incident reporting and clinical auditing.	The existence of a special cause variation does not specify the cause but further investigations would be needed to find out the cause. Like other statistical tools, CUSUM is liable for false positive and false negative alarms depending on where the control limits were placed. Case-mix adjustment is an important step in developing CUSUM but it can be challenging and prone to errors.
Twijnstra et al. (2014)	CUSUM charts allowed professionals to continuously monitor their surgical performance. It can help improve patient safety.	Despite the correction for case-mix, alarms were seen possibly because of the case-adjustment model.
Boulkedid et al. (2010)	It was feasible to develop CUSUM charts for 19 indicators to monitor the quality in obstetric and gynaecology department. They provide an easy to understand representation of data.	
Papanna et al. (2011)	The methodology for using CUSUM can be used to develop learning curve for other competencies.	The control limits of CUSUM charts should reflect accepted standards which are rarely available. Frequent alarms and rare alarms may indicate that the limits may have been set unrealistically.
(Hollesen et al. 2018)	The continuous use of data made it possible for the team to evaluate the changes they tested, communicate progress to others outside the team and compare current status to the aim.	
(Mukhtar-Yola et al. 2018)	Provide periodic project updates to the labour and delivery team by displaying run charts on the wards to show progress being made and the role of resuscitation champions for onsite mentoring	
(O'Brien and Pillai 2017)	They provide a robust method to detect variation in rates of perforation in an individual service that warrant special attention.	The control limits do not tell us if our rates were above or below those experienced elsewhere or whether these rates were acceptable.

Appendix 10: Ethic Approval from the University of Bradford



Microsoft Corporation [US] https://outlook.office.com/owa/projection.aspx

Reply all | Delete Junk | ...

RE: Ethics Application E556

E Ethics
Fri 22/07, 11:27 AM
Ethics; Waleed Al Nadabi; Bryan Mcintosh

Reply all

Inbox

This message was sent with high importance.

Action Items

Dear Bryan and Waleed

Ethics Application: E556

Your ethics application has now been reviewed by one independent reviewer and the Chair of the Research Ethics Panel.

I am pleased to inform you that your study has been given ethics approval, with no further ethical scrutiny required.
Please note that this approval is subject to a review of grammar and the use of language throughout the application. We request that you take the time to review grammar and language use in your documents for consistency before you start the research.

NOTE that approval is for this study only. Should there be any changes, you must stop your research and inform ethics@bradford.ac.uk at the earliest.
Once we have reviewed the changes and you have approval, only then can you recommence the study.
Failure to follow this will render your original approval invalid and withdrawn.

Please add a sentence onto any material you share with participants confirming that ethics approval has been granted by the Chair of the Humanities, Social and Health Sciences Research Ethics Panel at the University of Bradford on 22nd July 2016.

Thank you
Best Wishes
Omar

UNIVERSITY of BRADFORD

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Appendix 11: Ethics Approval from MoH, Sultanate of Oman

Sultanate of Oman
Ministry of Health
Directorate General of Planning & Studies

سلطنة عمان
وزارة الصحة
المديرية العامة للتخطيط والدراسات

Ref. :MoH/DGPS/CSR/PROPOSAL_ APPROVED /2/2017 ..... :الرقم

Date :.....5.1.2017..... ..... :التاريخ

..... :الموافق

Waleed Al Nadabi
Principal Investigator

Study Title : **"A national multidimensional quality of care monitoring system "**

After compliments

We are pleased to inform you that your research proposal **"A national multidimensional quality of care monitoring system "** has been approved by Research and Ethical Review & Approve Committee, Ministry of Health.

Regards,

Dr. Ahmed Mohamed Al Qasmi
Director General of Planning and Studies
Chairman, Research and Ethical Review and Approve Committee
Ministry of Health, Sultanate of Oman.

Cc
Day file

Appendix 12: Information Sheet for staff, Patient Safety Culture Study

Dear participant,

Patient safety is a high priority and strongly influenced by patient safety culture. The Safety Attitudes Questionnaire (SAQ) that you are receiving is an internationally tested tool that will be used to assess the staff perception and attitudes towards patient safety culture in your department.
Your assistance in completing this questionnaire is highly appreciated and will definitely inform decision makers at different levels on priority actions directed at improving the safety culture in your department.
Completing this questionnaire is voluntary, will not affect you career development and will take less 10 minutes of your valuable time. This questionnaire is anonymous as no name or staff number is requested.
This questionnaire is part of a larger national study undertaken by Dr. Waleed Al Nadabi, Director of Monitoring and Evaluation, as part of his PhD study in the University of Bradford. If you have any questions or queries about the study or the questionnaire, please feel free to contact me using the contact details below. This study has been ethically approved by the MoH central ethics committee *(Research and Ethical Review & Approve Committee (RERAC)* as well as by the University of Bradford Ethics Committee.

Many thanks for accepting to participate in this study.

Name of Investigator: Dr. Waleed Al Nadabi
PhD student, University of Bradford, United Kingdom
Job title: Director of Monitoring and Evaluation, DG of Planning and Studies, Ministry of Health
Tel Number: 00968 99200304
Email: alnadabi2030@yahoo.com or w.k.a.alnadabi@bradford.ac.uk

Appendix 13: Information Sheet for patient, patient satisfaction study

دراسة لقياس رضى المريض عن خدمات المستشفى

عزيزتي المريضة/ عزيزي المرافق

ندعوكِ للمشاركة في هذه الدراسة التي تهدف للتعرف على وجهة نظر المريض في الخدمة التي يقدمها قسم النساء والولادة بالمستشفى، إن مشاركتكم في هذه الدراسة مهمة جدا، حيث أنها ستمكن المخططين ومتخذي القرار في اتخاذ الخطوات التحسينية والتطويرية المناسبة في المستقبل، سوف لن يستغرق تعبئة هذه الإستمارة أكثر من 5 دقائق من وقتكم الثمين. ونشكركم مقدما على مشاركتكم في هذه الدراسة.

ونؤكد لكم أن جميع إجاباتكم سيتم التعامل معها بسرية وخصوصية تامة، ولن يتمكن أحد من التعرف عليكم بأي طريقة كانت حيث لن يُطلب منكم تعبئة أسمائكم ولا أرقام تواصلكم ولا غير ذلك. ونؤكد أيضا أن إجاباتكم لن تؤثر على مستوى الخدمة التي ستقدم لكم سواء الان أو في المستقبل.

مرةً أخرى، نشكركم على تخصيص قدر من وقتكم للمشاركة في هذه الدراسة، متمنين لكم دوام الصحة والعافية.

اسم الباحث: د/ وليد بن خميس الندابي

طالب دكتوراة في جامعة برادفور

المملكة المتحدة

رقم الهاتف: 99200304

البريد الإلتكروني: w.k.a.alnadabi@bradford.ac.uk أو alnadabi2030@yahoo.com

Dear participant,

You are invited to take part in this study that aims to examine patients' views on the services provided by the maternity care in the hospital. This study will help decision makers for future planning and improvements. It is expected that completing the questionnaire will not take more than 10 minutes of your time. Your participation is highly appreciated

Your answers will be strictly anonymous and confidential. No one will be able to identify you in any way. Your answers will not negatively affect any health care that you may need either now or in future.

Once more, many thanks for your time and we wish very healthy life.

Name of Investigator: Dr. Waleed Al Nadabi

Appendix 14: SAQ Short Form by Sexton (2003) (modified version)

Safety Attitudes Questionnaire: Frontline Perspectives from Maternity Department

I work in the (clinical area or patient care area where you typically spend your time): _____ **This is in the Department of:** _____ **Please complete this survey with respect to your experiences in this clinical area.**

Please answer the following items with respect to your specific unit or clinical area. Choose your responses using the scale below:

A	B	C	D	E	X
Disagree Strongly	Disagree Slightly	Neutral	Agree Slightly	Agree Strongly	Not Applicable

1. Nurse input is well received in this clinical area.	A B C D E X
2. In this clinical area, it is difficult to speak up if I perceive a problem with patient care.	A B C D E X
3. Disagreements in this clinical area are resolved appropriately (i.e., not *who* is right, but *what* is best for the patient).	A B C D E X
4. I have the support I need from other personnel to care for patients.	A B C D E X
5. It is easy for personnel here to ask questions when there is something that they do not understand.	A B C D E X
6. The physicians and nurses here work together as a well-coordinated team.	A B C D E X
7. I would feel safe being treated here as a patient.	A B C D E X
8. Medical errors are handled appropriately in this clinical area.	A B C D E X
9. I know the proper channels to direct questions regarding patient safety in this clinical area.	A B C D E X
10. I receive appropriate feedback about my performance.	A B C D E X
11. In this clinical area, it is difficult to discuss errors.	A B C D E X
12. I am encouraged by my colleagues to report any patient safety concerns I may have.	A B C D E X
13. The culture in this clinical area makes it easy to learn from the errors of others.	A B C D E X
14. My suggestions about safety would be acted upon if I expressed them to management.	A B C D E X
15. I like my job.	A B C D E X
16. Working here is like being part of a large family.	A B C D E X
17. This is a good place to work.	A B C D E X
18. I am proud to work in this clinical area.	A B C D E X
19. Morale in this clinical area is high.	A B C D E X
20. When my workload becomes excessive, my performance is impaired.	A B C D E X
21. I am less effective at work when fatigued.	A B C D E X
22. I am more likely to make errors in tense or hostile situations.	A B C D E X
23. Fatigue impairs my performance during emergency situations (e.g. emergency resuscitation, seizure).	A B C D E X
24. Management in this clinical area supports my daily efforts.	A B C D E X
25. Management in this clinical area doesn't knowingly compromise pt safety:	A B C D E X
26. Management in this clinical area is doing a good job:	A B C D E X
27. Problem personnel are dealt with constructively by our unit management.	A B C D E X
28. I get adequate, timely info about events that might affect my work, from:	A B C D E X
29. The levels of staffing in this clinical area are sufficient to handle the number of patients.	A B C D E X
30. This hospital does a good job of training new personnel.	A B C D E X
31. All the necessary information for diagnostic and therapeutic decisions is routinely available to me.	A B C D E X
32. Trainees in my discipline are adequately supervised.	A B C D E X
33. I experience good collaboration with nurses in this clinical area.	A B C D E X
34. I experience good collaboration with staff physicians in this clinical area.	A B C D E X
35. I experience good collaboration with pharmacists in this clinical area.	A B C D E X
36. Communication breakdowns that lead to delays in delivery of care are common.	A B C D E X
37. Please give your work area/unit an overall grade on patient safety: ○ Excellent ○ Very Good ○ Acceptable ○ Poor ○ Failing	

BACKGROUND INFORMATION

Have you completed this survey before? ○ Yes ○ No ○ Don't Know **Today's Date (month/year):** _____

Position: (mark only one)

- ○ Obstetrician
- ○ Resident
- ○ Physician
- ○ Medical Intern
- ○ Medical Student
- ○ Nurse Manager/Charge
- ○ Deputy Nurse Manager/Charge
- ○ Registered Nurse
- ○ Midwife
- ○ Intern Nurse
- ○ Student Nurse
- ○ Other _____

Nationality: ○ Omani ○ Non-Omani

Mark your gender: ○ Male ○ Female

Years in specialty: ○ Less than 6 months ○ 6 to 11 months ○ 1 to2 yrs ○ 3 to4 yr ○ 5 to 10 yrs ○ 11 to 20 yrs ○ 21 or more

Appendix 15: Number of targeted staff (maternity department) in the participating hospital

Hospital name	**Number of doctors in maternity department**	**Maternity ward**		**Obs &Gyne Ward**		**Labour room**		**Total**
		Nurses	**Midwives**	**Nurses**	**Midwives**	**Nurses**	**Midwives**	
As Sultan Qaboos Hospital	39	34	5	23	1	-	39	141
Nizwa Hospital	20	27	3	20	1	-	30	101
Sur Hospital	15	-	-	35	2	19	8	79
Ibra Hospital	13	-	-	24	1	19	12	69
Sohar Hospital	32	36	1	32	2	0	77	180
ArRustaq Hospital	24	21	2	24	4	0	36	111
Al Buraymi Hospital	18	16	4	-	-	11	8	57
Ibri Hospital	19	21	3	19	4	-	38	104
Khasab Hospital	9	0	0	13	0	0	8	30
Grand Total	189	155	18	190	15	49	256	872

Appendix 16: An action plan for distributing and collecting the SAQ forms

A methodological action plan for conducting the patient safety culture study

1. What information is needed before starting the study: number of maternity doctors, midwives, nurses working in the maternity department. Please refer to the table below.
2. When to distribute the questionnaire (Nurses and doctors)
    1. Preferably Monday (the second day of the week) but you can choose the most appropriate date after discussion with head of maternity department and head of nursing department.
3. To whom will it be distributed?
    1. Doctor, nurses and midwifes working in maternity departments (Maternity ward, Obstetric and genecology ward, and labour room).
4. Shall we include Interns/Medical Students and Interns/Nursing Students?
    1. Yes, provided that they have worked in the Maternity department for at least 4 weeks before receiving the questionnaire
5. Where to distribute the questionnaire
    1. Doctor: during their morning meeting (after agreeing/informing the head of department before distributing the questionnaire and showing them the supporting letter from the Quality Centre/ Hospital Executive Director). If it was not possible to fill the questionnaire during the meeting, they can take it with them, fill it in their own time and return it back to either to quality department or nurse in-charge if it was more convenient. However, it is advisable that the form is filled during the meeting to ensure maximum response rate.
    2. Nurses: to be submitted by the in charge of the wards and labour room.
6. Who will distribute the questionnaire
    1. Head/staff of quality department will distribute the questionnaires to doctors in their meeting and the nurse in-charges of the wards and labour room will distribute to the nurses and midwifes.
7. How to distribute the questionnaire
    1. A hard copy of the questionnaire is handed to participants along with a self-adhesive envelop that has a pen inside. At the time of distribution please do not insert the questionnaire inside the envelope. The envelope is provided to double assure participants about the confidentiality. Pens are provided to ensure that every participant can easily fill the form. After completing the questionnaire, request participants to put it inside the envelope.
8. How many copies each hospital will get
    1. Based on the number of doctors, nurses, and midwifes in wards (maternity + OBS&Gyne) and labour room + 5 extra copies for each area. Why Copies are numbered and lettered?
    2. To know exactly how many copies were given to each group. For example:
    3. For doctors: D1 to D100
    4. For nurses and midwifes in Maternity ward: M1 to M100
    5. For nurses and midwifes in Obstetrics and Gynaecology ward: G1 to G100
    6. For nurses and midwifes in labour room: L1 to L100
9. Can I print extra copies?
    1. Yes you can if necessary. BUT, you need to continue numbering as per the above guideline.
10. How long will the study take?
    1. A maximum of three weeks (with the reminders, see below)
11. Encouraging and Reminding: when and how frequent?
    1. The target is to reach 100% response rate. Thus, the study is considered completed once this rate is reached. If for any reason this target was not reached, head of quality department will make a second attempt (one week after the first attempt) to distribute the questionnaire during the morning meeting of doctors. The aims of the second attempt are
        - To remind those who have not returned back their forms and encourage those who have not participated. An extra copy can be provided if they lost/misplaced their form.
        - Also, doctors who were not in the meeting in the first attempt can be reached and encourage them to participate in the study.
    2. If for any reason the response rate has not reached 80% after the second encouragement/reminder, a third and last attempt is to be made one week following the second attempt.
    3. The same applies for nurses. The forms are collected from the nurse in-charges after a week from receiving the questionnaire. Once 100% response rate is achieved the study is considered complete. If for any reason this was not achieved, the nurse in-charges are given another week to get the maximum response. If by the second week the response was less than 80%, they are encouraged and reminded for the 3rd and last week.
12. Piloting in one hospital: why?

1. Sohar hospital will be used for piloting this methodology. Major changes are not expected but learning lessons will be incorporated in the methodology.

13. What to do with the filled questionnaires?
    1. To be forwarded to the director of patient safety and risk management along with the empty questionnaire and envelops. The envelops with completed forms are to be inserted in a larger envelope titled 'Patient Safety Culture study: envelops with completed questionnaires' from XX hospital.
14. What extra information to be included when forwarding the envelops?
    1. An official letter form the head of quality department is sent to the director of patient safety and risk management in the DG quality centre with a copy to the executive director summarising the number of questionnaire that have been distributed and received. Please see the table below.
15. Are there any key messages that should be conveyed to participants?
    1. The following key messages need to be conveyed to doctors during their meeting and to ward in-charges:
    a. This study is a national study conducted in all regional hospitals.
    b. Your participation is highly appreciated.
    c. The questionnaire is a single sided questionnaire and will take less than 10 minutes from your valuable time.
    d. Information is highly confidential and the self-adhesive envelops are provided to extra assure confidentiality. Names and IDs are not requested. You are requested to complete the questionnaire to best reflect your own responses.
    e. Once data are analysed, feedback will provided to you.
    f. Please complete all the items in the questionnaire to the best that matches you.
    g. If you have any technical question/suggestion, please do not hesitate to contact the principal investigator as detailed in the front sheet of the questionnaire.
16. How to get support from hospital executives?
    - An official letter will be sent from the DG of quality centre to all executive directors requesting them to support the quality department in conducting the study with a copy to the head of quality department, head of maternity department, and head of nursing department. The ethics approval letter will be attached to the letter to assure executives that this study is approved centrally.

Table showing the Data required before conducting the patient safety culture study

Hospital name	Number of doctors	Maternity ward		Obs&Gyne Ward		Labour room		Total
		Nurses	Midwives	Nurses	Midwives	Nurses	Midwives	
Sultan Qaboos Hospital								
Nizwa Hospital								
Sur Hospital								
Ibra Hospital								
Sohar Hospital								
Rustaq Hospital								
Al Buraymi Hospital								
Ibri Hospital								
Khasab Hospital								

Table showing the Summary of the number of questionnaire distributed and returned for the patient safety culture study

Hospital name:	Total	Doctors	Nurses + midwifes (Maternity ward)	Nurses + midwifes (Obstetric and Gynaecology ward)	Nurse + midwifes (labour room)
Questionnaires Returned (R)					
Questionnaires Distributed (D)					
Percentage (R/D)					

Appendix 17: Coding system for SAQ used to study PSC in secondary care hospitals

Hospital	**For the hospital**	**For Doctors**	**For staff in Obs&Gyne Ward**	**For staff in Maternity ward**	**For staff Labour room**
As Sultan Qaboos Hospital	SQ	SQD	SQG	SQM	SQL
Nizwa Hospital	NZ	NZD	NZG	NZM	NZL
Sur Hospital	SU	SUD	SUG	SUM	SUL
Ibra Hospital	IB	IBD	IBG	IBM	IBL
Sohar Hospital	SOH	SOHD	SOHG	SOHM	SOHL
Ar Rustaq Hospital	RU	RUD	RUG	RUM	RUL
Al Buraymi Hospital	BU	BUD	BUG	BUM	BUL
Ibri Hospital	IBRI	IBRID	IBRIG	IBRIM	IBRIL
Khasab Hospital	KH	KHD	KHG	KHM	KHL
Hayma Hospital	HA	HAD	HAG	HAM	HAL

Appendix 18: Safety score by safety items (H1-H10)

Hospital	H1 M (SD)	H2 M (SD)	H3 M (SD)	H4 M (SD)	H5 M (SD)	H6 M (SD)	H7 M (SD)	H8 M (SD)	H9 M (SD)	H10 M (SD)	Total M (SD)
Total	3.8 (1.3)	3.6 (1.2)	3.7 (1.2)	3.6 (1.1)	3.7 (1.3)	3.6 (1.1)	3.8 (1.2)	3.6 (1.3)	3.6 (1.3)	3.8 (1.2)	3.7 (1.3)
N	1798	604	1388	3006	1017	3250	3416	3729	5081	2224	25513
1	4.2 (1.1)	4.1 (1.2)	3.9 (1.0)	3.6 (1.4)	4.1 (1.2)	3.8 (0.9)	3.9 (1.1)	3.8 (1.2)	3.8 (1.3)	4.1 (1.1)	3.9 (1.2)
N	50	15	38	85	28	93	98	104	146	62	719
2	3.3 (1.5)	2.9 (1.2)	3.6 (1.3)	3.6 (1.1)	2.6 (1.1)	2.8 (1.4)	3.8 (1.3)	3.2 (1.4)	3.6 (1.4)	3.2 (1.4)	3.4 (1.4)
N	51	17	38	82	27	93	102	103	145	63	721
3	3.9 (1.0)	3.4 (1.1)	4.0 (1.1)	3.7 (1.1)	4.0 (0.9)	3.7 (1.0)	3.7 (1.0)	3.5 (1.2)	3.8 (1.1)	3.9 (1.2)	3.7 (1.1)
N	48	17	40	82	29	93	97	104	141	61	712
4	4.0 (1.2)	4.4 (0.9)	4.1 (1.1)	3.8 (1.2)	4.1 (1.1)	3.8 (1.0)	3.9 (1.2)	4.1 (1.2)	3.7 (1.3)	4.2 (1.1)	3.9 (1.2)
N	51	17	38	83	29	90	96	105	144	63	716
5	4.2 (1.2)	4.1 (1.1)	3.9 (1.1)	3.7 (1.2)	4.1 (1.0)	4.0 (1.0)	4.1 (1.1)	3.8 (1.2)	4.0 (1.2)	4.2 (1.0)	4.0 (1.1)
N	49	17	40	84	28	93	95	105	141	62	714
6	4.0 (1.2)	4.4 (0.7)	3.9 (1.2)	3.6 (1.0)	4.2 (1.0)	3.8 (1.1)	4.2 (1.0)	3.5 (1.2)	3.8 (1.3)	4.2 (0.9)	3.9 (1.2)
N	51	17	40	81	28	93	97	106	143	62	718
7	4.2 (1.1)	4.1 (0.8)	3.9 (1.1)	4.0 (1.1)	3.8 (1.1)	3.8 (1.0)	4.1 (1.0)	3.9 (1.2)	3.8 (1.2)	4.1 (1.0)	3.9 (1.1)
N	51	17	38	85	29	91	96	105	143	63	718
8	4.3 (1.0)	4.3 (0.8)	4.1 (0.9)	3.4 (1.0)	3.7 (1.2)	3.6 (1.1)	3.9 (1.1)	4.0 (1.1)	3.6 (1.4)	4.0 (1.1)	3.8 (1.2)
N	51	17	39	85	29	92	95	101	144	63	716
9	4.2 (1.2)	4.2 (0.8)	4.1 (0.9)	3.3 (1.3)	4.2 (0.9)	3.9 (0.9)	4.0 (1.1)	4.1 (1.1)	3.9 (1.2)	4.0 (1.1)	3.9 (1.1)
N	49	17	38	85	29	89	93	104	141	62	707
10	3.9 (1.4)	4.1 (0.5)	3.7 (1.1)	3.6 (1.2)	3.2 (1.3)	3.6 (1.0)	4.0 (1.1)	3.3 (1.5)	3.6 (1.4)	3.9 (0.9)	3.7 (1.2)
N	51	17	39	80	28	91	96	105	140	63	710
11	3.3 (1.5)	3.0 (1.2)	3.4 (1.3)	3.3 (1.1)	2.8 (1.2)	3.1 (1.3)	3.8 (1.3)	2.8 (1.4)	3.3 (1.4)	3.2 (1.3)	3.2 (1.3)
N	50	17	37	86	28	92	96	102	138	63	709
12	4.3 (0.9)	4.1 (0.9)	4.0 (1.1)	3.8 (1.1)	4.3 (0.8)	3.9 (1.0)	3.8 (1.3)	4.0 (1.1)	3.8 (1.3)	4.2 (1.1)	4.0 (1.1)
N	50	17	39	84	29	93	98	105	142	61	718

13	3.9 (1.2)	3.6 (0.8)	4.0 (0.9)	3.6 (1.1)	3.7 (1.2)	3.8 (0.9)	4.0 (1.0)	3.8 (1.2)	3.7 (1.3)	4.1 (1.0)	3.8 (1.1)
N	50	17	40	83	27	93	95	103	139	63	710
14	3.8 (1.2)	3.5 (0.9)	3.8 (0.9)	3.7 (1.1)	3.6 (1.2)	3.7 (0.9)	3.9 (1.1)	3.6 (1.1)	3.6 (1.2)	3.8 (1.2)	3.7 (1.1)
N	50	17	39	80	29	89	91	103	140	62	700
15	4.6 (0.9)	4.3 (0.8)	4.3 (1.0)	4.0 (1.1)	4.7 (0.8)	4.1 (1.0)	4.4 (1.0)	4.4 (1.0)	4.3 (1.1)	4.5 (0.9)	4.3 (1.0)
N	51	17	39	83	29	91	91	104	144	63	712
16	4.3 (1.2)	4.1 (1.0)	4.0 (0.9)	4.0 (1.1)	4.4 (0.8)	4.1 (1.0)	4.3 (0.9)	4.0 (1.1)	4.1 (1.1)	4.4 (1.0)	4.2 (1.0)
N	50	17	40	83	29	90	96	103	143	61	712
17	4.2 (1.2)	3.5 (1.1)	4.1 (0.9)	3.9 (1.2)	4.4 (1.0)	4.0 (1.1)	4.1 (1.1)	3.8 (1.2)	3.9 (1.3)	4.3 (1.0)	4.0 (1.2)
N	49	17	40	85	29	91	97	101	143	63	715
18	4.4 (1.0)	3.7 (1.2)	4.1 (0.9)	3.9 (1.1)	4.4 (1.0)	4.0 (1.1)	4.2 (1.1)	4.0 (1.0)	4.1 (1.2)	4.3 (0.9)	4.1 (1.1)
N	49	17	37	84	29	90	92	105	145	63	711
19	4.1 (1.1)	3.7 (1.0)	4.0 (1.1)	3.7 (1.0)	4.1 (0.9)	3.9 (1.0)	3.9 (1.1)	3.6 (1.2)	3.8 (1.3)	4.3 (0.9)	3.9 (1.1)
N	49	17	38	85	28	88	96	102	138	62	703
20	3.4 (1.5)	3.4 (1.5)	3.7 (1.3)	3.5 (1.1)	3.6 (1.4)	3.4 (1.3)	3.5 (1.5)	3.9 (1.2)	3.6 (1.3)	3.7 (1.3)	3.6 (1.3)
N	51	17	39	83	29	89	97	104	137	61	707
21	3.1 (1.4)	2.8 (1.6)	3.5 (1.5)	3.3 (1.1)	2.5 (1.4)	3.2 (1.3)	3.4 (1.5)	3.4 (1.4)	3.4 (1.4)	3.5 (1.5)	3.3 (1.4)
N	50	16	38	84	28	90	94	103	143	61	707
22	2.4 (1.5)	2.8 (1.3)	2.9 (1.4)	3.2 (1.1)	2.1 (1.2)	3.0 (1.4)	2.8 (1.5)	3.1 (1.4)	3.0 (1.4)	3.0 (1.4)	2.9 (1.4)
N	49	17	39	84	27	89	94	104	138	58	699
23	2.4 (1.6)	2.8 (1.5)	2.9 (1.5)	3.3 (1.2)	2.1 (1.4)	3.0 (1.3)	3.0 (1.5)	2.6 (1.5)	2.8 (1.4)	2.7 (1.6)	2.8 (1.4)
N	51	17	39	80	28	86	96	102	142	63	704
24	3.9 (1.2)	3.6 (1.0)	4.0 (1.0)	3.6 (1.0)	3.8 (0.9)	3.7 (0.9)	3.7 (1.2)	3.4 (1.3)	3.7 (1.2)	3.8 (1.2)	3.7 (1.1)
N	50	17	37	84	29	88	96	105	142	60	708
25	3.3 (1.5)	2.9 (1.1)	2.7 (1.3)	3.5 (1.2)	3.4 (1.3)	3.3 (1.2)	3.4 (1.4)	3.4 (1.2)	3.0 (1.3)	3.5 (1.4)	3.3 (1.3)
N	48	17	38	83	29	88	90	100	138	59	690
26	4.2 (1.0)	3.5 (1.2)	4.2 (0.9)	3.7 (1.0)	4.2 (0.9)	3.7 (1.0)	4.2 (1.0)	3.8 (1.3)	3.7 (1.3)	4.1 (1.1)	3.9 (1.1)
N	49	16	40	84	29	87	95	105	139	61	705
27	3.7 (1.2)	3.3 (1.1)	3.5 (1.1)	3.6 (1.0)	3.6 (1.3)	3.4 (1.0)	3.9 (1.2)	3.3 (1.3)	3.4 (1.3)	3.5 (1.3)	3.5 (1.2)

N	49	16	37	84	28	84	89	102	136	62	687
28	3.9 (1.1)	3.5 (0.9)	3.3 (1.3)	3.4 (1.0)	3.0 (1.0)	3.5 (1.0)	3.7 (1.1)	3.5 (1.1)	3.6 (1.3)	3.8 (1.1)	3.6 (1.1)
N	48	16	38	85	28	89	90	102	141	62	699
29	3.0 (1.5)	2.9 (1.5)	2.5 (1.4)	2.6 (1.2)	2.8 (1.6)	3.0 (1.4)	3.0 (1.5)	2.2 (1.4)	3.2 (1.6)	2.4 (1.4)	2.8 (1.5)
N	51	16	39	84	28	90	91	104	143	62	708
30	3.7 (1.3)	3.4 (1.3)	3.4 (1.2)	3.6 (1.2)	3.8 (1.4)	3.7 (1.1)	3.8 (1.0)	3.6 (1.4)	3.5 (1.4)	4.0 (1.0)	3.6 (1.2)
N	51	17	38	86	27	93	91	105	142	62	712
31	3.9 (1.2)	3.8 (0.8)	3.6 (0.9)	3.3 (1.0)	3.2 (1.2)	3.8 (0.9)	3.9 (0.9)	3.8 (1.1)	3.5 (1.3)	3.7 (1.3)	3.7 (1.1)
N	49	17	38	86	28	91	96	105	143	62	715
32	4.0 (1.2)	3.2 (1.2)	3.6 (1.0)	3.5 (1.1)	3.6 (1.2)	3.7 (0.9)	4.0 (1.0)	3.7 (1.1)	3.7 (1.3)	3.9 (1.1)	3.7 (1.1)
N	51	17	37	84	28	88	96	104	142	63	710
33	4.5 (1.0)	4.4 (0.6)	4.2 (0.9)	4.0 (1.0)	4.2 (0.9)	4.0 (1.1)	4.2 (1.0)	4.2 (0.9)	4.0 (1.2)	4.3 (1.0)	4.1 (1.0)
N	51	17	40	85	29	91	96	106	145	63	723
34	3.9 (1.1)	3.7 (1.0)	3.7 (1.0)	3.8 (1.1)	4.1 (1.1)	3.7 (1.0)	3.9 (1.1)	3.6 (1.2)	3.7 (1.3)	4.3 (0.8)	3.8 (1.1)
N	51	17	40	85	29	93	96	104	144	63	722
35	4.1 (1.0)	3.4 (0.9)	3.7 (1.0)	3.4 (1.2)	3.7 (1.0)	3.8 (1.1)	3.8 (1.2)	3.9 (1.1)	3.6 (1.2)	4.1 (1.0)	3.8 (1.1)
N	51	17	38	84	28	91	95	103	139	62	708
36	2.9 (1.4)	3.1 (1.3)	2.1 (1.0)	2.9 (1.0)	3.1 (1.3)	2.7 (1.3)	3.4 (1.3)	2.7 (1.3)	2.7 (1.3)	3.0 (1.5)	2.8 (1.3)
N	48	16	36	76	24	88	97	101	127	55	668

M: Mean score **SD:** Standard Deviation

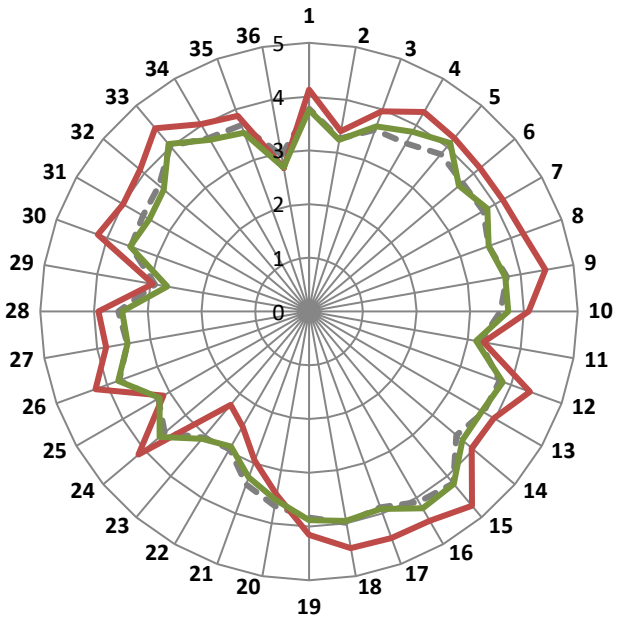
Appendix 19: References considered for full text review but excluded and the reason for exclusion

Author	Why excluded
(Gabrani et al. 2016)	Measured safety culture but ethnicity/nationality was not discussed
(Groves et al. 2011)	Discussed the theory of safety culture. Not an original study.
(Hamdan and Saleem 2013)	Association between safety and ethnicity/nationality/language was not discussed
(Kagawa-Singer et al. 2010)	A review not a primitive study. Association was not discussed in the included studies.
(S. Alayed et al. 2014)	Did not discuss association. Just outlined that cultural heterogeneity needs further analysis
(Smith et al. 2011)	Did not discuss safety culture and its association with ethnicity/nationality but discusses the ability of validated tool to detect transcultural variation
(Zhu et al. 2017)	Measured safety culture but ethnicity/nationality was not discussed

Appendix 20: Mean scores with Standards Deviation (SD) for each safety items by nurses' nationality

	Omani nurses		Non-Omani nurses		Missing nurses		All nurses	
	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)	N
	3.6 (1.2)	4094	3.9 (1.3)	6411	3.6 (1.2)	8365	3.7 (1.3)	18870
Question number								
1	3.8 (1.2)	113	4.1 (1.1)	180	3.8 (1.2)	235	3.9 (1.2)	528
2	3.2 (1.3)	116	3.4 (1.5)	180	3.3 (1.3)	236	3.3 (1.4)	532
3	3.7 (1.1)	116	4.0 (1.0)	177	3.6 (1.1)	231	3.7 (1.1)	524
4	3.9 (1.2)	116	4.3 (1.1)	179	3.6 (1.3)	232	3.9 (1.2)	527
5	4.1 (1.0)	113	4.2 (1.0)	180	3.8 (1.2)	233	4.0 (1.1)	526
6	3.6 (1.1)	117	4.2 (1.1)	180	3.7 (1.2)	233	3.9 (1.1)	530
7	3.8 (1.1)	118	4.2 (1.1)	179	3.7 (1.1)	235	3.9 (1.1)	532
8	3.6 (1.1)	116	4.2 (1.0)	180	3.6 (1.3)	232	3.8 (1.2)	528
9	3.7 (1.1)	117	4.5 (0.8)	178	3.7 (1.2)	232	4.0 (1.1)	527
10	3.7 (1.1)	116	4.1 (1.1)	178	3.6 (1.2)	232	3.8 (1.2)	526
11	3.2 (1.2)	113	3.3 (1.4)	179	3.2 (1.3)	231	3.2 (1.3)	523
12	3.8 (1.1)	115	4.4 (0.9)	180	3.8 (1.2)	235	4.0 (1.1)	530
13	3.7 (1.0)	115	4.0 (1.0)	177	3.8 (1.1)	232	3.8 (1.1)	524
14	3.7 (1.0)	113	3.9 (1.1)	176	3.6 (1.1)	230	3.7 (1.1)	519
15	4.2 (1.0)	116	4.7 (0.7)	181	4.2 (1.1)	233	4.4 (1.0)	530
16	4.2 (1.0)	114	4.5 (0.8)	180	4.1 (1.1)	235	4.3 (1.0)	529
17	3.9 (1.2)	117	4.5 (0.9)	178	3.9 (1.2)	236	4.1 (1.2)	531
18	4.0 (1.1)	113	4.5 (0.9)	181	4.0 (1.2)	233	4.1 (1.1)	527
19	3.9 (1.0)	111	4.2 (1.0)	178	3.8 (1.1)	229	4.0 (1.1)	518
20	3.6 (1.2)	113	3.5 (1.4)	179	3.7 (1.2)	232	3.6 (1.3)	524
21	3.3 (1.2)	114	2.9 (1.5)	176	3.4 (1.3)	232	3.2 (1.4)	522
22	2.9 (1.2)	111	2.5 (1.4)	177	3.0 (1.4)	229	2.8 (1.4)	517
23	3.1 (1.3)	113	2.3 (1.4)	180	3.1 (1.4)	233	2.8 (1.4)	526
24	3.6 (1.0)	111	4.1 (1.0)	178	3.5 (1.2)	238	3.7 (1.1)	527
25	3.2 (1.1)	106	3.1 (1.5)	176	3.2 (1.2)	226	3.2 (1.3)	508
26	3.8 (1.0)	112	4.2 (1.1)	176	3.8 (1.1)	233	3.9 (1.1)	521
27	3.4 (1.0)	108	3.8 (1.3)	173	3.4 (1.2)	225	3.6 (1.2)	506
28	3.5 (1.1)	113	3.9 (1.1)	174	3.5 (1.1)	230	3.7 (1.1)	517
29	2.7 (1.4)	115	2.9 (1.6)	177	2.9 (1.5)	231	2.9 (1.5)	523
30	3.5 (1.1)	114	4.2 (1.1)	179	3.5 (1.2)	231	3.8 (1.2)	524
31	3.4 (1.0)	116	4.0 (1.1)	179	3.6 (1.1)	232	3.7 (1.1)	527
32	3.5 (1.0)	116	4.1 (1.0)	179	3.6 (1.2)	233	3.8 (1.1)	528
33	4.1 (1.1)	116	4.5 (0.8)	181	4.0 (1.1)	239	4.2 (1.0)	536
34	3.7 (1.0)	116	4.0 (1.1)	179	3.7 (1.2)	238	3.8 (1.1)	533
35	3.5 (1.1)	111	3.9 (1.1)	180	3.7 (1.2)	233	3.7 (1.1)	524
36	2.7 (1.2)	104	2.7 (1.4)	167	3.0 (1.3)	225	2.8 (1.3)	496

Appendix 21: A Radar plot showing safety item mean score by nationality (Red line: Non-Omanis, Green line: Omanis, Grey dotted line: Missing. p<0.001 for all categories)



Appendix 22: The SSQ tool by Harvey et al. (2002)

1.	**Experience has shown that I can have appropriate and adequate control over my care.**					
	Strong disagree					Strongly agree
	1	2	3	4	5	6	7
2.	**The person(s) responsible for my care are/were caring and compassionate.**					
	Strong disagree					Strongly agree
	1	2	3	4	5	6	7
3.	**Problems that have arisen up to now have not been dealt with effectively.**					
	Strong disagree					Strongly agree
	1	2	3	4	5	6	7
4.	**My needs have been addressed with appropriate consideration for my time**					
	Strong disagree					Strongly agree
	1	2	3	4	5	6	7
5.	**The overall organization of my care has not been appropriate.**					
	Strong disagree					Strongly agree
	1	2	3	4	5	6	7
6.	**I would choose the same type of care for my next pregnancy.**					
	Strong disagree					Strongly agree
	1	2	3	4	5	6	7

Appendix 23: The PPS tool by Siassakos et al. (2009)

Dimension	The phrase of the question
Communication	I felt well informed due to good communication'
Respect	'I felt I was treated with respect at all times'
Safety	'I felt safe at all times'

Appendix 24: Questionnaire used to pilot test of the SSQ and one item of the PPS

Dear participant,

As a mother, you are kindly requested to give each of the questions a score from 1 to 5 based on the given criteria. Where 1 is the lowest score and 5 is the highest score.

Clarity: how clear is the question to you, **Acceptability**: how acceptable is the question to the Omani culture? **Importance:** how importance is the question to you?

1. Experience has shown that I can have appropriate and adequate control over my care.	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**
2. The person(s) responsible for my care are/were caring and compassionate.	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**
3. Problems that have arisen up to now have not been dealt with effectively.	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**
4. My needs have been addressed with appropriate consideration for my time	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**
5. The overall organization of my care has not been appropriate.	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**
6. I would choose the same type of care for my next pregnancy.	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**
7. I felt safe at all times	Clarity	**1**	**2**	**3**	**4**	**5**
	Acceptability	**1**	**2**	**3**	**4**	**5**
	Importance	**1**	**2**	**3**	**4**	**5**

Appendix 25: The final English version of the Short Patient Perception Questionnaire (SPPQ)

	Strongly disagree						Strongly agree
1. I felt that I had adequate control over my care.	1	2	3	4	5	6	7
2. The staff(s) responsible for my care were caring and compassionate.	1	2	3	4	5	6	7
3. Problems arose were not dealt with effectively.	1	2	3	4	5	6	7
4. My needs have been addressed with appropriate consideration for my time	1	2	3	4	5	6	7
5. I felt involved in the procedures related to my care	1	2	3	4	5	6	7
6. The overall organization of my care has not been appropriate.	1	2	3	4	5	6	7
7. I would choose the same type of care for my next pregnancy.	1	2	3	4	5	6	7
8. I felt safe at all times	1	2	3	4	5	6	7
9. I felt well informed due to good communication	1	2	3	4	5	6	7
10. I felt I was treated with respect at all times	1	2	3	4	5	6	7

Please answer the following sections in relation to the **mother's** details.

11. Mother's Year of birth (please write in):	
12. Mother's Level of education	**(a)** No education **(b)** primary school **(c)** secondary school **(d)** tertiary school (diploma) **(e)** graduate **(f)** postgraduate
13. Mother's Employment:	**(a)** Employed **(b)** Not Employed **(c)** Retired
14. Does the mother suffer from any long term medical condition (e.g. diabetes, hypertension, etc.…)	(a) No (b) Yes (please specify) :
15. Is this your first delivery?	**(a)** Yes **(b)** the second delivery **(c)** the third delivery **(d)** fourth or more
16. Did you give birth to…?	**(a)** Single baby **(b)** Twins **(c)** Triplets or more
17. Your pregnancy was…?	**(a)** Normal vaginal delivery **(b)** Vaginal assisted delivery **(c)** planned Caesarean section **(d)** Emergency caesarean section
18. How many weeks pregnant were you when your baby was born?	(a) Less than 37 weeks (b) 37 weeks or more
19. Is this the first delivery in this hospital?	(a) Yes (b) No

If there is anything else you would like to tell us about your maternity care, please do so here **and** at the **back of the page**

Appendix 26: The final Arabic version of the Short Patient Perception Questionnaire (SPPQ)

	لا أوفق أبدا						أوافق بشدة
1. شعرتُ بأنّ لديَّ تحكما كافيا بالرعاية التي أحصل عليها	1	2	3	4	5	6	7
2. الموظفون المسئولون عن رعايتي كانوا مهتمين ولطيفين	1	2	3	4	5	6	7
3. المشاكل التي واجهتها لم يتم التعامل معها بفاعلية	1	2	3	4	5	6	7
4. احتياجاتي تمّ التعامل معها بشكل يتناسب مع وقتي	1	2	3	4	5	6	7
5. شعرتُ أنه تم إشراكي في الإجراءات المتعلقة برعايتي الصحية	1	2	3	4	5	6	7
6. التنظيم العام لرعايتي لم يكن مناسبا	1	2	3	4	5	6	7
7. سوف أختارُ نفسَ النوع من الرعاية في الحمل القادم	1	2	3	4	5	6	7
8. شعرتُ أنني بأمانٍ في كلِ الأوقات	1	2	3	4	5	6	7
9. شعرتُ أنني مطلعة على حالتي من خلال التواصل الجيد	1	2	3	4	5	6	7
10. شعرتُ أنه تم التعامل معي باحترام في جميع الأوقات	1	2	3	4	5	6	7

الرجاء الإجابة على الأسئلة التالية المتعلقة بتفاصيل الأم

11. سنة الميلاد للأم:

12. المستوى التعليمي للأم: **(أ)** غير متعلمة **(ب)** ابتدائي **(ج)** اعدادي **(د)** ثانوي/دبلوم عام **(هـ)** باكلوريوس/دبلوم عالي **(و)** دراسات عليا

13. الحالة الوظيفية للأم: **(أ)** موظفة **(ب)** ربة بيت/غير موظفة **(ج)** متقاعدة

14. هل تعاني الأم من مرض مزمن (مثل الضغط، السكري، الخ...) (أ) لا (ب) نعم (الرجاء التحديد):

15. هل هذه هي ولادتك الأولى؟ **(أ)** نعم **(ب)** الولادة الثانية **(ج)** الولادة الثالثة **(د)** الولادة الرابعة وأكثر

16. في هذه المرة كم مولودا أنجبتي؟ **(أ)** مولودا واحد **(ب)** توأم **(ج)** 3 مواليد أوأكثر

17. كيف كانت طريقة الولادة؟ **(أ)** ولادة طبيعية **(ب)** ولادة طبيعية مع استخدام الوسائل المساعدة **(ج)** عملية قيصرية اختيارية **(د)** عملية قيصيرية طارئة

18. كم كانت عدد أسابيع الحمل عند الولادة؟ (أ) أقل من 37 أسبوع (ب) 37 أسبوع وأكثر

19. هل كانت هذه الولادة الأولى في هذا المستشفى؟ (أ) نعم (ب) لا

20. هل هناك أيَّ شيءٍ آخر تودين قوله لنا بخصوص خدمات الولادة في المستشفى؟، الرجاء كتابة ذلك هنا وفي **خلف** الصفحة

Appendix 27: An Action Plan for distributing the patient satisfaction survey

A methodological action plan for conducting the patient satisfaction study

1. When to distribute the questionnaire
   - On the day of discharge (all days including weekends).
2. To whom will it be distributed?
   - To mothers who gave a delivery.
3. Where to distribute the questionnaire
   - At the bedside.
4. Who will distribute the questionnaire
   Head/staff of quality department will distribute the questionnaires ward In-charge of maternity department. The ward In-charge/staff will in turn distribute the questionnaire to mothers.
6. How to distribute the questionnaire
   A hard copy of the questionnaire is handed to participants along with a self-adhesive envelop that has a pen inside. At the time of distribution please do not insert the questionnaire inside the envelope. *The envelope is provided to double assure participants about the confidentiality. Pens are provided to ensure that every participant can easily fill the form.* After completing the questionnaire, request participants to put it inside the envelope.
7. How many copies each hospital will get
   Based on the average number of discharges per month for each hospital + 10 extra copies
8. Why Copies are numbered?
   To know exactly how many copies were given to participants and how many were returned back. For example Sohar 001 to Sohar 100
9. Can I print extra copies?
   Yes you can if necessary. **BUT**, you need to continue numbering as per the above guideline.
10. How long will the study take?
    Around four weeks.
12. What to do with the filled questionnaires?
    To be forwarded to the director of patient safety and risk management along with the empty questionnaire and envelops. The envelops with completed forms are to be inserted in a larger envelope titled 'Patient Satisfaction Study: envelops with completed questionnaires' from XX hospital.
13. What extra information to be included when forwarding the envelops?
    An official letter form the head of quality department is sent to the director of patient safety and risk management in the DG quality centre with a copy to the executive director summarising the number of questionnaire that have been distributed and received. Please see the tables below.
14. Are there any key messages that should be conveyed to ward In-charge and ward nurses?
    The following key messages need to be conveyed:
    - Nurses are not to influence the response of patients by any means.
    - Nurses should not guide or help in filling the questionnaire.
    - The questionnaire is a single sided questionnaire and will take less than 4 minutes to fill.
    - Information is highly confidential and the self-adhesive envelops are provided to extra assure confidentiality. Names and patient IDs are not requested.

15. How to get support from hospital executives?
    An official letter will be sent from the DG of quality centre to all executive directors requesting them to support the quality department in conducting the study with a copy to the head of quality department, head of maternity department, and head of nursing department. The ethics approval letter will be attached to the letter to assure executives that this study is approved centrally.

Table showing the Data required before conducting the patient safety culture study

Hospital name	Number patient being discharged per month with deliveries (A)	Total number of discharges from the maternity department (B)	Percentage (A/B)