DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE CARE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE

by

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[redacted]

THESIS

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DECLARATION

I, Mpho Gift Moratho, declare that “Development and validation of a model for midwives who care for sick neonates in Neonatal Intensive Care Units of public hospitals, Limpopo Province ” for the degree Doctor of Philosophy in Nursing is my own work, and that all the sources utilised have been indicated and acknowledged using complete references both in-text and list of references, and has never been submitted by me for any degree at this or any other institution.

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Moratho MG (Ms) Date: 14/08/2023

DEDICATION

This study is dedicated to:

My family, for their love, encouragement, and support throughout my pursuit of this degree. In particular, my husband Petrus Tau, for his love, protection, support, encouragement, and financial assistance.

My parents, Bishop Modjadji and the late Bishop Madimetja Moratho; Pastor Thabiso and Tshedi Montjane, for their prayers, support, and encouragement in helping me achieve my goals and maintain my faith.

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DEFINITIONS OF CONCEPTS

Development

Development is the process of coming into the existence or of creating something new or more advanced (Merriam-Webster, 2010). In this study, development will be the process of creating a model for ensuring quality neonatal care for utilisation by neonatal-trained nurses and midwives.

Midwife

According to the Nursing Act No. 33 of 2005 (South African Nursing Council [SANC], 2005), a midwife shall mean a person who is registered as such in terms of Section 31 (1) and practicing the caring profession and also registered under South African Nursing Council (SANC). In this study, midwife refers to midwives and accoucheurs working in neonatal intensive care units of the selected public hospitals, Limpopo Province.

Model

LoBiondo-Wood and Haber (2010) define a model as a schematic presentation of reality which is systematically constructed and aids healthcare providers in organising practice for the benefit of the client and the profession. In this study, the model refers to the diagrammatic presentation of identified concepts related to quality neonatal care that can be utilised by the midwives to comprehend and place compound events into a viewpoint and allows for investigations with regard to the prediction of future outcomes.

Neonatal

Neonatal is the period from birth to the end of 28 days (Harrison, 2012). In this study, neonatal refers to newborn infants from delivery to one month.

Neonatal care

Neonatal is the acts of intervening, interfering or interceding taken by health care practitioners with the intent of modifying the neonatal outcomes (Wan and Benson, 2013). In this study, neonatal care mean thermoregulation, neonatal resuscitation, prevention of hypothermia, oxygen therapy skin care, cord care, kangaroo mother care, positioning and handling, and also pain management implemented by the midwives towards the sick infants in order to improve the quality of neonatal care.

Neonatal Intensive Care Unit

The Neonatal Intensive Care Unit (NICU) is a hospital intensive care unit that specialises in the provision of care to small and sick neonates (Bird,2020). In this study, a neonatal intensive care unit refers to a unit that specialises in admitting and providing Level II and Level III intensive care to small and sick neonates at Limpopo Province.

Neonatal mortality

Neonatal mortality refers to the total of newborn infants who died during the first month of life. (Agrawal, Kumar, Balasubramaniam, Bhargava, Sinha et al., 2016). In this study, neonatal mortality refers to the deaths of neonates from neonatal- related conditions and complications.

Public hospitals

Public hospitals are institutions owned by the government that provide neonatal, obstetric, medical, surgical and psychiatric care (Scutchfield., Prybil., Kelly and Mays, 2016). In this study, public hospitals will be to the healthcare institutions owned by the government, that provide care of sick patients including neonatal care.

Quality

Quality refers to the standards of something as measured against other things of a similar kind or the extent of the excellence of something (Merrium-Webter, 2010) In this study, quality means the provision of best neonatal care services which will increase the likelihood of the desired neonatal outcomes.

Sick neonates

Sick neonates are unwell infants under the age of one year, more specifically newborn babies (World Health Organisation [WHO] , 2014). In this study, sick infants refer to the sick and small neonates under the age of 28 days who are admitted to the Neonatal Intensive Care Units (NICUs), with respiratory distress, fever, low body temperature, seizures, lethargic and low or high blood glucose and other conditions.

Validation

Validation is an act that draws on the traditional methods of science to substantiate the accuracy of conceptual meaning in terms of empiric evidence, interacts with replication to challenge and authenticate empiric knowledge. It may also refer to newer methods for establishing the credibility or truth value of knowledge structures within the empiric pattern (Chinn and Kramer, 2018). In this study, validation refers to the task of demonstrating that the model is a reasonable representation of the actual system.

LIST OF ABBREVIATIONS AND ACRONYMS

ANC	Antenatal care
COVID-19	Coronavirus Disease 2019
CPAP	Continuous Positive Airway Pressure
DoH	Department of Health
ECMO	Extra Corporeal Membrane Oxygenation
FADE	Focus, Analyse, Develop Evaluate
KM	Kilometres
KMC	Kangaroo Mother Care
HS	Human Services
LBW	Low Birth Weight
LINC	Limpopo Initiative for Newborn Care
MAS	Meconium Aspiration Syndrome
MDGs	Millenium Development Goals
MLS	Millilitres
MSSN	Management of Sick and Small Newborn
NICU	Neonatal Intensive Care Unit
NMRs	Neonatal Mortality Rates
PPHN	Persistent Pulmonary Hypertension of the Newborn
RD	Respiratory Distress
RDS	Respiratory Distress Syndrome
SA	South Africa
SANC	South African Nursing Council
SDGs	Sustainable Development Goals
SPSS	Statistical Package for Social Science
TTN	Transient Tachypnea of the Newborn
UK	United Kingdom
UNICEF	United Nations International Children’s Emergency Fund
USA	United States of America
WHO	World Health Organisation

ABSTRACT

Background: Providing quality neonatal care is one of the most challenging health care services globally. Ensuring quality care during pregnancy and delivery is paramount to improving health outcomes and reducing mortality and morbidity among neonates. About 2.9 million neonatal deaths occur worldwide, accounting for 40% under 5 years' deaths. Poor quality care in health care organisations is thought to be one of the factors for the slow progress the in reduction of neonatal deaths. Furthermore, poor quality care is not just about the availability of resources in a health institution, nor is it just about the absence of services. In South Africa, the midwives providing care to sick neonates usually lack experience and competence mainly because of shortage of midwives and lack of training in neonatal care, and neonatal intensive care.

Purpose: The purpose of this study was to develop and validate a model for midwives who care for sick neonates in Neonatal Intensive Care Units (NICUs) of public hospitals in Limpopo Province.

Methodology: An exploratory, sequential mixed - method design was used in this study. The study was conducted in all five districts of Limpopo Province using one hospital per district. The population was all the midwives allocated to the NICUs of the five hospitals. The total population size for the qualitative phase was 58 midwives. The total sample size of 12 participants (6 from each hospital) was selected purposefully for the qualitative phase. Qualitative data collection and analysis were done to explore the phenomenon, identify themes, design a data collection instrument, and pre-test it by pilot study. The findings of the qualitative phase were used to develop the quantitative data collection tools, to conduct the quantitative data collection and analysis. Measures to ensure trustworthiness were followed. The interview guide was used to collect data through one-to-one semi-structured interviews. Tesch's eight steps in the coding process were used to analyse the qualitative data. The population for the quantitative phase included 82 midwives who were allocated in the NICUs in the four public hospitals. Slovin's formula was used to calculate the sample size. The sample size was 68 participants for the quantitative phase. Reliability and validity were established. Quantitative data analysis was done through SPSS version 25. The collected data were coded and analysed through descriptive statistics.

Ethical considerations: The proposed study was approved and cleared by the Intra-departmental Review Committee. Ethical clearance was obtained from the Turfloop Research Ethics Committee (TREC). Permission to conduct the study was granted by the Limpopo Province Department of Health Ethics Committee. Further permission to collect data from public hospitals was granted by hospital managers. The interview guide and consent form were formulated in English. Scientific adherence to ethical principles was ensured. In qualitative processes, member checks, independent coding and the reviews were done by the supervisor. The study was language edited to ensure it is readable. Turnitin was done to minimise plagiarism.

Development and validation of a model: A model was developed utilising the concept analyses and the findings of the study to ensure quality care by the midwives. Experts in the field of the study were given the validation tool to assess the model.

Significance of the study: The findings from this study might increase the likelihood of desired neonatal health outcomes and identify the gaps in the knowledge of care of sick infants to be addressed in the neonatal care.

Key words: model, midwives; neonates; neonatal intensive care; quality neonatal care.

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CHAPTER 1

OVERVIEW OF THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Providing quality neonatal care is one of the most challenging health care services globally (Spitzer, 2017). According to Brizuela, Leslie, Sharma, Langer and Tuncalp (2019), ensuring quality of care during pregnancy and delivery is paramount to improving health outcomes and reducing mortality and morbidity among neonates. Rhoda, Velaphi, Gcbhardt, Kauchali and Barron (2018) assert that 2.9 million neonatal deaths occur worldwide, accounting for 40% under 5 years' deaths. Poor quality of care in health care organisations is thought to be one of the factors to the slow progress in reduction of neonatal deaths (Ma, Olds & Dunton, 2015). Furthermore, poor quality care are not just about the availability of resources in a health institution, neither it is just about the absence of services (Wan & Benson, 2013). The poor provision of quality care in the Neonatal Intensive Care Units (NICUs) high rates of NMR could result from the various factors such as inadequate physical infrastructure, lack of human resources, poor knowledge, lack of skills and capacity to deal with both neonatal conditions and complications that require prompt care (Mabaso, Ndaba & Mkhize-Kwitshana, 2014).

Midwifery is associated with more efficient use of resources and improved outcomes when provided by midwives who are skilled and trained, and midwives are only effective when integrated into the health system in the context of effective teamwork and referral mechanisms and adequate resources (Mabasa, et al., 2014). Midwives provide an critical role in ensuring quality neonatal care and their presence in the care of neonates is regarded as key to this. However, their skills and abilities are more essential than their presence (Spitzer, 2017). International Confederation of Midwives defines a midwife as "a person who has successfully completed a midwifery programme that is recognised in the country and globally".

Furthermore, the midwife is recognised as a responsible and accountable professional who works in partnership with women to give the necessary support, care and advice during pregnancy, labour and the postpartum period, to conduct births on the midwife's own responsibility and to provide care for the neonates. This care includes preventative measures, the promotion of normal birth, the detection of complications in mother and neonates, the accessing of medical care or other appropriate assistance and the carrying out of emergency measures. The optimum midwifery services are among the most effective ways in rendering high-quality neonatal care. More important, maternal health care plays a major role in the neonatal health and outcomes (Agrawal et al., 2016). Midwives play an important role in provision of quality care to the small and sick neonates through the use of neonatal care.

There is a global concern regarding the overuse of interventions that were designed to manage complications (Byass, 2017). Shah, Warre and Lee (2013) assert that quality challenges in health care can emerge from disparity in practice, underuse and overuse of health care and discrepancies in quality of care. Moreover, it was reported in an investigation of the variation in Neonatal Intensive Care Unit (NICU) admissions across the use by birthweight classifications and concluded that there is underuse of NICU care for small neonates ≤ 1500g and potentially overuse of NICU care for larger neonates ≥2500g (Bourque, Dahan, Mantha, Robson & Reichherzer, 2018).

Given the high neonatal mortality in developing countries, saving neonates lives is a key priority for global and national health policy agendas. To improve quality of care, it is crucial to clearly define this concept and develop and apply models that are user-friendly and relevant to health services in both resourced and poorly resourced settings. Murphy, Nicholson, Browne and Turner (2015) developed a model of care for neonatal services in Ireland for quality of neonatal care in Neonatal Intensive Care Unit (NICU). The model defines how neonatal services should be delivered, so that babies get the right care, at the right time, in the right place by the right staff.

Ulhaq (2015) argued that there is strong evidence that the rates of mortality in the developed countries are remarkably less than those in the developing countries, because of their well-structured neonatal training programmes, excellent neonatal care, ongoing research and advances in highly sophisticated equipment and modern technology. Furthermore, one of the most important reasons for very low neonatal mortality rate in the United Kingdom (UK) is its high standards of care. A registered midwife in UK needs to have extra training and experience to work as a neonatal nurse. Such training enables the neonatal nurses to play a great role in reducing mortality rates and improving neonatal care (Cooper, 2016). In addition, for quality of neonatal care to improve, midwives must make it their task to maintain and upgrade their competence or skills by continuous learning (Akseer, Lawn, Keenan, Konstantopoulos, Cooper, Ismali et al., 2015).

Brizuela et al. (2019) conclude that regardless of increase in health care institutional deliveries and skilled birth attendants worldwide, only few countries were able to achieve the Millennium Development Goals (MDGs) of reducing infant mortality rates in 2015. Furthermore, ensuring healthy lives and promoting well-being and reducing neonatal mortality remains a priority of Sustainable Development Goals (SDGs) set by the United Nations. Particular targets are to reduce neonatal mortality to at least as low as 12 per 1000 live birth by 2030 (United Nations, 2015). Although current levels of the neonatal mortality rates are within reach as the SDG target of 12 per 1000 live birth, the total number of deaths is unacceptable high in a lower-middle income country such as South Africa. The recent neonatal mortality rate of 21 per 1000 live birth reported by the SA Demographic Health Survey is of major concern. If SA is to meet the SDG target, special attention should be given to the availability of high-impact intervention, providing an adequate number of appropriately trained healthcare providers (Rhoda et al., 2018).

According to Ntuli, Malangu and Alberts (2013), the most common causes of neonatal deaths reported in neonatal unit in Level 3 hospital in Limpopo Province were prematurity, perinatal asphyxia, pneumonia and neonatal infections. Furthermore, The Neonatal Mortality Rates (NMRs) in Limpopo Province accounted for 48.3% in the year 2012-2013. In 2014/2015 in Limpopo Province, neonatal mortality rates of 24.7 per 1000 live births were recorded (Department of Health [DoH], 2016). The Limpopo Initiatives for Newborn Care (LINC) model was established in 2003. The aim was to assist the midwives who care for sick neonates to improve the quality of neonatal care; however, the current neonatal NMRs (14 per 1000 live birth) remain a considerable concern in the four provinces of South Africa including Limpopo Province (Mabaso et al., 2014). Therefore, the current study attempts to develop and validate a model for midwives who care for sick neonates in NICUs of public hospitals, Limpopo Province, thus improving the quality of neonatal care and reducing neonatal mortality rates.

1.2 Problem statement

There is a concern in the developing countries about the provision of quality care and high NMRs as 2.9 million newborn infants die in the first month of life according to the statistics. South Africa is one of the developing countries with high NMRs which accounts for approximately 14 per 1000 live births. Ensuring healthy lives and promoting well-being and reduction of neonatal mortality is one of the priorities of the SDGs and it is a major concern in Africa, including South Africa. In addition, the outcome of care for neonates in public hospitals reflects the evidence-based practice used and the overall quality of services provided (Byass, 2017).

The researcher observed during clinical accompaniment that midwives in NICUs provide neonatal care with inadequate human and material resource which negatively influenced the quality of care provided to the small and sick neonates. Furthermore, some of the equipment such as incubators and phototherapy units were non-functional which also played a negative role in the quality of neonatal care. Regardless of the efforts to improve the quality of care in the NICUs of the hospitals under study through workshops, training programmes for midwives, clear guidelines and recommendations set by the Saving Babies, World Health Organisation (WHO), LINC and United Nations International Children's Emergency Fund (UNICEF), provision of quality neonatal care remains a challenge in South Africa (Pattinson, 2011).

The effort to address challenge to related poor quality neonatal care has received little attention. Therefore, in the researcher's perspective, a model for midwives who care for sick neonates would make a difference in improving neonatal outcomes in Limpopo and the country at large. In spite of the high number of neonatal deaths resulting from poor quality care recorded in Limpopo Province, to date no research has been done to develop a model for midwives who care for sick neonates in NICUs (DoH, 2016). The researcher identified a gap in many studies conducted in the past by Schmidt, Bounnack and Hoehn (2018); Wise and Darmstadt (2015), Cario and

Travers (2016); Ramaboea, (2014), which pay attention to high neonatal mortality rates, not on the provision of quality neonatal care. Therefore, it is against this background that the researcher identified the need to develop and validate a model for midwives who care for sick neonates in NICUs of public hospitals in Limpopo Province.

1.3 Theoretical framework

Theoretical framework is conceptual frame of a research which incorporates a specific crew of beliefs and ideas that relate to the phenomena of inquiry (Chinn & Kramer, 2018). Two theories were used to guide this study namely: Donabedian’s Quality of Care Model and Practice-Oriented Theory.

1.3.1 The Donabedian’s Quality of Care Model

The Donabedian’s Quality of Care Model guided this study in order that it could not deviate from its purpose, as is the appropriate framework for determining the quality of care. In addition, this model was used to evaluate the structure, process and outcomes of care provided by midwives (Donabedian, 2005). Donabedian’s Quality of Care Model consists of the three components approach for evaluating quality of care that support measurement for improvement. The three components include the structure, process and outcomes. Moreover, it is believed that the structure measures have an effect on process measures, which in turn affect outcome measures (Donabedian, 2005).

1.3.2 Practice-Oriented Theory

Practice-Oriented Theory is a goal-directed and order of the required actions that are essential to yield the needed outcomes (Dickoff., James & Wiedenbach, 1968). Dickoff et al. (1968) maintain that if a Practice-Oriented Theory is developed centred on empirical evidence, it guides practice. Practice-Oriented Theory guided the process of development of a model for midwives who care for sick neonates in NICUs (figure 6.1). In addition, Chin and Kramer (2008) and Walker and Avant’s (2011) steps for model or theory construction and validation will be used respectively.

1.4 Purpose of the study

The purpose of this study was to develop and validate a model for midwives who care for sick neonates in NICUs of public hospitals, Limpopo Province.

1.4.1 Objectives of the study

The objectives of this study were to:

- Explore the challenges of midwives regarding the neonatal care they provide to sick neonates in the neonatal intensive care units of public hospitals, Limpopo Province.
- Assess the factors influencing the quality of neonatal care for the sick neonates in the NICUs of public hospitals, Limpopo Province.
- Develop a model for midwives who care for the sick neonates in the neonatal intensive care units of public hospitals, Limpopo Province.
- Validate a model for midwives who care for sick neonates in the NICUs of public hospitals, Limpopo Province by maternal-newborn health care experts and model development experts.

1.5 Research questions

- What are the challenges of midwives who care for sick neonates in the NICUs of public hospitals, Limpopo Province?
- What are the factors influencing care for the sick neonates in the NICUs of public hospitals, Limpopo Province?
- What model can be developed for midwives who care for the sick neonates in the NICUs of public hospitals, Limpopo Province?
- How can maternal-newborn health care experts and model development experts validate a model for midwives who care for sick neonates in NICU?

1.6 Research methodology and design

The mixed - method approach, which is the combination of the qualitative and quantitative approaches, was used in this study. Creswell (2014) define mixed - method research as a design with philosophical assumptions as well as methods inquiry, with involves both collecting and analysing qualitative and quantitative data, meaning both numeric and text information are collected. The core assumption of this form of inquiry is that the combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone.

Exploratory sequential mixed - method design was used in this study. Qualitative data collection and analysis were done to explore the phenomenon, identify themes, design a data collection instrument, and pre-test it. The findings of qualitative phase were used to develop the quantitative data collection tool after which quantitative data collection and analysis were then carried out. The priority is usually given to the qualitative data and the two methods are integrated during the interpretation phase. The aim of this design was to use quantitative results to assist in explaining and interpreting the findings of initial qualitative results from the first phase of the study. According to Creswell (2014), the qualitative results usually inform the types of respondents to be selected for the quantitative phase and the types of questions to be asked of the respondents, thus it assisted in development of the questionnaire (Appendix II).

The study was conducted in the five districts of the Limpopo Province. The following hospitals namely: Hospital A, Hospital E, Hospital S and Hospital I are Level II hospitals which also cater for sick neonates from the surrounding district hospitals. The neonates who need more advanced care are transferred to Hospital G in the Capricorn District which is the only Level III hospital providing for neonatal intensive care at Level III.

For the qualitative part, the population was all the midwives allocated in the NICUs of Hospital G and Hospital A of Limpopo Province. The total population for the study was 58 midwives as indicated in Table 3.1 The non-probability criterion purposive sampling was employed for this study to select the two (2) public hospitals from the five (5) districts, because they offer neonatal intensive care to sick neonates. The duty roster was used to purposefully select the participants. The sample size was twelve (12) participants (6 per two hospitals) and was determined by data saturation. The interview guide (Appendix II) which consisted of central question and probing questions was used to collect data. The central question asked is "*Could you please tell me about the challenges you encountered when rendering neonatal health care services to sick neonates in your unit"?* Tesch's eight steps in the coding process

(Creswell, 2014a) were used to analyse data. The researcher paid careful attention to the qualitative data analysis steps and determine what findings to build on. themes and sub-themes were used to summarise data.

In the quantitative phase, the population was all the midwives (N=82) allocated in the NICUs of Hospital G (N=46), Hospital I (N=14), Hospital E (N=12) and Hospital S (N=10) of Limpopo Province. According to Creswell (2014b), sampling is guided by the qualitative results. However, the simple random sampling was used to select the sample (n=68) because other participants from Hospital G participated in the quantitative phase, therefore the total population could not be used. Considering the results categories as variables, the quantitative data collection tool was developed.

A model for midwives who care for sick neonates was developed utilising the concept analyses and the findings of the study to ensure quality care by the midwives working in NICUs of public hospitals in Limpopo Province. The model was then validated by the experts in the field of study using a questionnaire developed (Chinn & Kramer, 2008). A detailed methodology is discussed in chapter 3 of this study.

1.7 Significance of the study

The findings from this study might increase the likelihood of desired neonatal health outcomes and identify the gaps in the knowledge of care of the sick infants to be addressed in the neonatal care. In addition, the findings of this study will be useful for the midwives, neonatal trained nurses and managers working to improve the quality of neonatal care and stimulate quality awareness among health care providers of maternal and neonatal health care. The DoH may also benefit by improving the policies and procedures for good quality neonatal care. Sick neonates might benefit by receiving the quality neonatal care provided by midwives using the developed model. The findings may also contribute to the improvement of neonatal quality of life and results in reduction of the neonatal mortality rates in South Africa.

1.8 Layout of subsequent chapters

Chapter 2: Literature review

Covers the literature review on quality neonatal care and models review.

Chapter 3: Research methodology

Presents the research methodology, research design, study sites, population and sampling, data collection method, data analysis, measures to ensure trustworthiness, validity and reliability and ethical considerations.

Chapter 4: Presentation and interpretation of findings

Deals with reports on the qualitative and quantitative research findings in the context of the aim and objectives of the study.

Chapter 5: Integration and discussion of findings

Discuss the integration of findings from independent qualitative and quantitative findings.

Chapter 6: Concept analysis

This chapter discusses the eight steps of concepts analysis by Walker and Avant (2011).

Chapter 7: Model development

This chapter discusses the development of the model

Chapter 8: Model Validation

Outlines model validation under the following features: clarity of the structure of the model, clarity of the concepts, scope of the model, extent of model use, context relationship of the model, critical reflection of the model, generality and significance of the model.

Chapter 9: Summary, limitations, recommendations and conclusion

Discusses the summary, limitations, recommendations and conclusion. Recommendations are based on the findings of the study in relation to quality neonatal care.

1.9 Summary

The current chapter presented an overview of the research study including the introduction and background. Providing quality neonatal care is one of the most challenging health care services globally (Spitzer, 2017). According to Brizuela, Leslie, Sharma, Langer and Tuncalp (2019), ensuring quality of care during pregnancy and delivery is paramount to improving health outcomes and reducing mortality and morbidity among neonates. Furthermore, the problem statement, aim of the study and research questions were also discussed. Donabedian's Quality of Care Model (Donabedian. 2003) and the Practice-Oriented Theory of Dickoff et al. (1968) were discussed. Finally, an outline of the structure of the thesis was presented. The research methodology and design were briefly discussed, and its application will be discussed in Chapter 3. The next chapter will focus on the reviewed literature.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The literature review was aimed at contributing to a clearer understanding of the nature and meaning of the problem that has been identified (Botma, Greeff & Mulaudzi, 2016). A narrative literature review was conducted. Electronic searches were done in the following databases: Science Direct, Sabinet, Emerald, PubMed and also the Google scholar from January 2012 till 2020. The search terms used were quality care, neonatal intensive care unit, neonatal mortality, neonatal care , neonatal mortality, and factors. Furthermore, models of quality of care were also reviewed. Articles selected for this study contained information that is directly related to the topic. International and national published articles were used. The summary of the reviewed literature and models are discussed below.

2.2 Description of quality of neonatal health care

In South Africa, neonatal mortality remains high due to a number of factors, including poor quality of neonatal care at health facilities. According to Raven et al. (2012), quality of health care is the performance of care according to the standards that are known to be safe, which are affordable to the patients and have the potential to yield an impact on mortality. Understanding what good quality of care is and how it can be evaluated is critical to improving health care services (Raven et al., 2012). Lavender (2016) strongly argues that quality of health care focuses on the way services are delivered, as opposed to what services are delivered hence, provision of care and quality of care are essential to each other. The Donabedian model aims to reduce costs while providing high quality of care and services to the sick neonates by reduction of mortality, reduced length of stay and reduced nosocomial infections (Donabedian, 2005). According to the study conducted by Haskin, Nyasulu, Davidge, McKerrow and Horwood (2018) in KwaZulu-Natal, mothers reported high levels of satisfaction with the care received, while the record review identified shortfalls in the quality of care provided. In addition, skills assessments showed poor resuscitation skills in neonatal units. The Limpopo Initiative for Newborn care is a provincial programme that was established in 2003 to improve the quality of all aspects of neonatal care in all hospitals in Limpopo Province. Furthermore, neonatal mortality rates decreased overall by 5% from 2006 to 2009 (Haskin et al., 2018).

2.3 Interventions for small and sick neonates

Interventions for small and sick neonates are crucial provisions of quality and reduction of neonatal mortality in neonates admitted in NICUs. According to Donabedian (2005), the component “outcome” has to do with the impact of the care on health status.

2.3.1. Essential newborn care

According to the WHO (2018), high-quality universal newborn health care is the right of every newborn everywhere. Neonates have the right to be protected from injury and infection, to breathe normally, to be warm and to be fed. All neonates should have access to essential newborn care, which is the critical care for all neonates in the first days after birth. Essential newborn care involves immediate care at the time of birth, and essential care during the entire newborn period.

Essential newborn care includes the following:

- Immediate care at birth (delayed cord clamping, thorough drying, assessment of breathing, skin-to-skin contact, early initiation of breastfeeding)
- Thermal care
- Resuscitation when needed
- Support for breast milk feeding
- Nurturing care
- Infection prevention
- Assessment of health problems
- Recognition and response to danger signs
- Timely and safe referral when needed

2.3.2 Prevention of neonatal hypothermia

Protection from the cold is thought to prevent some neonatal morbidities that result from being exposed to cold without protection. Hypothermia among neonates is considered an important contributor to neonatal mortality in low-resource settings. The WHO (2018) defined hypothermia as the body temperature below the normal ranges (36.5º-37.5ºC) and has been subcategorised into three grades namely: mild (36.0º- 36.5 ºC), moderate (32.0º- 35.9 ºC) and severe (less than 32 ºC). Head coverings have been shown to be useful but appear somewhat constrained by the choice of material. Midwives should attach temperature sensors early and allow for servocontrol to prevent under and overheating (Clifford and Hunt, 2010). According to de Almeida., Guinsburg, Sancho, Rosa, Lamy et al. (2014), hypothermia five minutes after birth and at NICU admission was observed in 44% and 51%, respectively, with 6% of early neonatal deaths. The study conducted by Fenta, Biyazin, Dagnaw, Dewey and Yetwale (2022) found that the prevalence of neonatal hypothermia was 62.9%. This is comparable to a study conducted on neonatal hypothermia and associated factors where the prevalence of neonatal hypothermia within six hours of delivery was reported at 66.3% (Bayih, Assefa, Dheresa, Minuye & Demis, 2019).

2.3.3 Neonatal respiratory care in NICU

According to Berger (2013), neonatal respiratory care continues to move forward at a truly excitable pace. Current technologic advances and an increasing number of randomised clinical trials are leading to improved neonatal outcomes. Respiratory distress (RD) is reported to occur in 4-7% of neonates of all gestational ages and is an important cause of neonatal mortality. In addition, most of deaths globally occur in low-and middle-income countries. Soraisham & Singhal (2017) assert that about 21% of the neonates presenting with illness in the first month of life have respiratory symptoms that may require respiratory support. Furthermore, in the developing countries, there is a need for neonatal care programs equipped with right respiratory equipment and trained staff (Sindhu, Agarwal & Sethi, 2017).

2.3.4 Neonatal resuscitation as an intervention in NICU s

Neonatal resuscitation is recognised as an intervention for which there is evidence of effectiveness. The WHO (2014) estimated that one quarter of all neonatal deaths globally are caused by perinatal asphyxia. The basic steps often needed most include drying, and stimulating the infant, positioning and clearing the airway and if still not breathing, applying positive pressure ventilation with the bag and mask. In Zambia, data on all-cause, neonatal mortality rates were collected and observed to decrease from 11.5 per 1000 live births to 6.8 deaths per 1000 live births after basic neonatal care training (Mildenberger, Ellis & Lee, 2017).

2.3.5 The use of Kangaroo mother care (KMC) in NICU

Kangaroo mother care (KMC) is an intervention for preterm infants which includes infants being carried, usually by the mother, with skin-to-skin contact. KMC involves a package of intermittent and continuous skin-to-skin contact, breastfeeding support, early discharge from hospital and supportive care in stable neonates (Bhutta et al., 2014). Globally, four million infants die in the first month of life and 27% of these deaths are directly attributed to low birth weight (LBW) and prematurity. In Malawi, there are 15, 000 neonatal deaths annually and 60-90% of these deaths are secondary to LBW, preterm infants who could significantly benefit from KMC. Cavicchiolo., Lanzoni., Wingi., Pizzol., Daverio et al. (2016) found that KMC improved overall survival of preterm infants in poor resource settings due to the introduction of KMC approach. In addition, KMC is an evidence-based approach that has been demonstrated to reduce mortality in preterm infants in poor resources countries. The finding of a study by Narciso et al. (2022) is consistent with the study by Cavicchiolo et al. (2016) which found that KMC had the effect of reducing the duration of stay in NICU because of the improved survival. Moreover, timely hospital discharge reduces overcrowding in neonatal units, thus reducing the chances of infants contracting hospital infections and the economic impact of hospital stay imposed on families of infants.

2.4 Factors influencing neonatal mortality in NICU

Even though Africa has made improvements towards reducing neonatal mortality, many neonates continue to die from preventable factors in NICU. Many factors have the potential to influence neonatal mortality in NICU, and several of these were covered in this section. Sindhu et al. (2017) and Edwards et al. (2013) pointed out the delay in seeking health care for neonatal conditions, health infrastructure in low-resource settings, cost of neonatal intensive care and lack of antenatal and poor intrapartum management as the factors that influence neonatal mortality.

2.5.1 Delay in seeking neonatal health care services

Delayed in seeking neonatal health care services has been linked to increased neonatal mortality. Lassi. Middleton. Bhutta and Crowther (2019) agree that in low- and middle-income countries, a large number of neonatal deaths occur as a result of delays in seeking neonatal health care services. Furthermore, they indicated that the delays occur at three levels which are delay in making decision to seek care, delay in access to care, and delay in receiving care. The study by Uchenna et al. (2016) yielded the same results as in the study by Lassi et al. (2019), where delays in reaching healthcare facilities accounted for the most common delays encountered by respondents, 78.0%, followed by delays at household level, 24.2% and delays at health facility level 16.0%. According to Sindhu et al. (2017), only 60% of caregivers seek health care for their neonates in South Asia. Potential reasons are lack of recognition of illness, socio-cultural factors, and lack of health facility near home, lack of transportation or insufficient funds to arrange for transport as well as poor quality of care at health facilities. The first component of the Donabedian model “structure” points out the attributes of settings where care is delivered such as the infrastructure (Donabedian, 2003).

2.5.2 Neonatal Sepsis

Neonatal sepsis which includes infection followed by inflammation, is one of the leading causes of mortality among neonates worldwide. It is classified according to the time of onset as early or late. In general, early neonatal sepsis is considered when the clinical condition appears within the first 72 hours of life. Neonates are at increased risk of sepsis due to their immature immune system (Voller and Myers, 2016). According to Milton., Gillespie., Calie., Taiyari., Carvalho et al. (2022) results concur with (Jyoti et al., 2021) did show that neonatal sepsis is a main factor of neonatal mortality within low-income and middle-income countries bearing the burden of 99% of global neonatal mortality. A study conducted in Ethiopia by Teshome., Kabthymer., Abebe., Melaku., Wudneh et al. (2022) agree with (Milton, 2022); Teshome, 2022) study findings that more than one-third of all neonatal mortality results from neonatal sepsis, which is one of the most common reasons for neonatal hospitalization and mortality in developing countries.

2.5.3 NICU infrastructure in low-resource settings

A survey conducted in India on neonatal care services, found that only four (4) out of 28 centres had adequate facilities and equipment to meet the standards of a Level II unit, and all the neonatal equipment in use was imported from abroad. Public hospitals serve the poor, have high caseloads, and suffer from poor quality of care (Edwards et al., 2013). In a study conducted by Martinez, Khu, Boo, Neo, Saysanasongkham and Partridge (2012), participants cited poor infrastructure (51%) as an obstacle to providing quality neonatal care. The finding is consistent with the study conducted by Nyikuri, Kumar, Jones and English (2019) which revealed nurses' dissatisfaction a properly laid-out NICU, and they observed small, overcrowded rooms in the public hospital NICUs wherein there were more incubators in the space available than is recommended.

2.5.4 Cost of neonatal intensive care

Costs of neonatal intensive care is another important factor influencing neonatal mortality in NICUs. Neonatal intensive care improves survival of the sick and small neonates but is associated with high costs. Sindhu et al. (2017) pointed out that the cost of neonatal intensive care is high, which most cannot afford. In a tertiary care teaching hospital NICU, the basic cost of a bed at a Level III NICU in 2010-2011 was 4969 per bed per day, compared to the mean monthly income of a low socio-economic Indian family. This study is consistent with the findings of the study conducted by Sharma and Murki (2021), who concludes that sick and small neonates admitted in NICU need countless care depending upon the severity of sickness and neonatal course like need of mechanical ventilation or non-invasive ventilation, administration of artificial surfactant, insertion of central lines, total parenteral nutrition, and many medications.

Furthermore, long stay in the NICU leads to high bills and increase the cost of neonatal care substantially. The largest contributors to overall care costs included the ventilated and nonventilated bed-day costs for the initial hospital stay, as well as long-term medical costs associated with neonatal conditions. The study findings by Narciso, Beleza and Imoto (2022) is inconsistent with the studies by Sindhu et al.

(2017); Sharma and Murki (2021), as it found that KMC as a neonatal care for small infants could reduce a length of stay and thus reduce the overall cost of neonatal health care services caused by long stay. The Donabedian model aims to reduce costs while providing high quality care and services to the sick and small neonates (Donabedian, 2003).

2.5.5 Lack of antenatal care booking and poor intrapartum care

Maternal health care plays a major role in the neonatal health and outcomes. Currently in South Africa, maternal health care services are free and accessible as part of safer motherhood, however, some of the pregnant women still opt not to book for antenatal care services. Antenatal care (ANC) provides healthcare services to the pregnant women in an effort to ensure the best possible pregnancy and neonatal outcomes, by antenatal preparation. The antenatal care services include screening, assessment of pregnancy risk, provision of health information and support to pregnant women and to make pregnancy and birth a positive life experience (Jinga, Mongwenyana, Moolla., Malete & Onoya, 2019).

According to Wolde, Gonete, Akalu, Baraki and Lakew (2019), a neonate who is born from a mother with no ANC had increased chances of neonatal mortality as compared to a mother who attended antenatal care equal to or greater than four times. Mersha., Bante and Shibiru's (2019) study result concurs with Wolde et al. (2019) which indicates that a number of the ANC follow-up had significantly reduced the risk of neonatal mortality because the pregnant woman avoids preventable risk factors due to early identification and treatment of the maternal conditions.

According to Sindhu et al. (2017), about 68% of pregnant women seek for antenatal care and the rates are lowest, (36-54%) in South Asia and Sub-Saharan Africa. The study conducted by Jinga et al. (2019) concur with the study by Sindhu et al. (2017) when it indicates that pregnant women do seek for antenatal care services, however, that is done very late in pregnancy. According to the second component of Donabedian model "process" emphasises whether or not good medical practices are followed (Donabedian, 2005).

The National Department of Health guidelines in South Africa recommend that pregnant women seek ANC services as early as the first missed menstrual period. All pregnant women are encouraged to attend eight ANC visits to reduce the risk of adverse obstetric and neonatal outcomes. In 2018, three quarters of women were observed to have made at least four ANC visits, 47% had an ANC visit in the first trimester, 32% first received ANC during the fourth or fifth month of pregnancy, 2% delayed care until the eighth month and about 6% were un-booked. Providing quality intrapartum care is a vital opportunity to ensure a good start in life for all neonates, and midwives hold the key to quality survival of every neonate.

2.6 Review of the models that guide provision of neonatal care services

The researcher reviewed the following models: Focus, Analyse, Develop Evaluate (FADE) quality improvement model, Model of care for neonatal services and the neonatal integrative developmental care model because they have aspects related to neonatal care.

2.6.1 Global perspective of the neonatal care model

FADE is a problem-solving quality improvement model developed by Organisational Dynamics, a private organisation of United States of America (USA) (USA, DoH and Human Servcies [HS], 2011). The FADE model consists of four phases namely focus, analyse, develop, and execute and evaluate. The model is used to find out the problem part and assess the magnitude of the problem, develop a process of minimising this problem. Then the process is executed and evaluated to improve the situation.

- *The four Phases of FADE model*

Phase 1: Focus -According to the FADE model to improve the quality of health care services the main consent is to prioritise the area of improvement and focus on it. Furthermore, focus on multiple issues may affect the appropriateness of the intervention programme and its successful implementation.

Phase 2: Analyse–A comprehensive analysis of the problem needs to be done to explore the hindering issues in the background, which are the barrier to provide quality care. Collect and analyse data to establish baseline, identify root causes and point towards possible solutions.

Phase 3: Develop–In this phase the baseline findings are used to develop appropriate action plans for improvement along with its implementation structure as a solution of the identified problems.

Phase 4: Execute and evaluate–Implement the action plans, on pilot basis as indicated and install an ongoing system monitoring to ensure success (USA, DoH and HS, 2011*)*.

2.6.2 Sub-Saharan perspective of neonatal care model

Murphy et al. (2015) developed a model of care for neonatal services in Ireland for quality of neonatal care in NICU. It defines how neonatal services should be delivered, so that babies get the right care, at the right time, in the right place by the right staff. The NICU should conform structurally to international standards. Adequate space is important to reduce cross-infection between neonates, and there is minimum acceptable distance between intensive care radiant warmers. There must be isolation facilities to cohort infected infants, and there should also be high quality hand washing facilities. The primary function of the tertiary neonatal units is to provide specialised care to infants who are critically ill. Tertiary care is about the activity, not the place. It is regarded as the facility where healthcare professionals have the necessary knowledge, training and experience to deliver intensive care to sick and small neonates (Murphy et al., 2015).

2.6.3 South African perspective of neonatal care model

The Neonatal Integrative Developmental Care Model identifies seven core measures that provides clinical guidance for NICU staff in delivering neuroprotective family-centred developmental care of premature infants and their families in the NICU. Core measures 1 (Healing environment): Addresses the physical environment of the NICU, including space. Core measure 2 (Partnering with families): Parents must be viewed as vital and essential members of the caregiving team and active partners in the care of their neonates (Altimier and Phillips, 2016).

Core measure 3 (Positioning and handling): Forming a “nest” with soft boundaries, as well as a padded foot-roll for foot-bracing, provides postural, behavioural, and physiological stability to the neonate. Core measure 4 (Safeguarding sleep): Frequent handling and touching can disturb sleep leading to deceased weight gain, decreased state regulation. Core measure 5 (Minimising stress and pain): Minimising stress and pain is essential in the developmentally unexpected, and often harsh, environment of the NICU where even routine care can be stressful, and often painful, to premature neonates (Altimier & Phillips, 2016).

Core measure 6 (Protecting skin): The premature infants have an underdeveloped skin barrier, which puts the infant at risk for high water loss, electrolyte imbalance, thermal instability, increased permeability, additional skin damage, delayed barrier maturation and infection. Core measure 7 (Optimising nutrition): Scientific evidence indicates that breastfeeding is the optimal method of infant feeding and should be promoted and supported to ensure optimal nutrition in for all infants whenever possible (Altimier & Phillips, 2016).

2.7 Theoretical framework

Theoretical framework is conceptual frame of a research which incorporates a specific crew of beliefs and ideas that relate to the phenomena of inquiry (Chinn & Kramer, 2018). Two theories were used to guide this study namely: Donabedian’s Quality of Care Model and Practice-Oriented Theory.

2.7.1 The Donabedian’s Quality of Care Model

The Donabedian’s Quality of Care Model guided this study in order that it could not deviate from its purpose, as is the appropriate framework for determining the quality of care. In addition, this model was used to evaluate the structure, process and outcomes of care provided by midwives (Donabedian, 2005). Donabedian’s Quality of Care Model consists of the three components approach for evaluating quality of care that support measurement for improvement. The three components include the structure, process and outcomes. Moreover, it is believed that the structure measures have an effect on process measures, which in turn affect outcome measures (Donabedian, 2005).

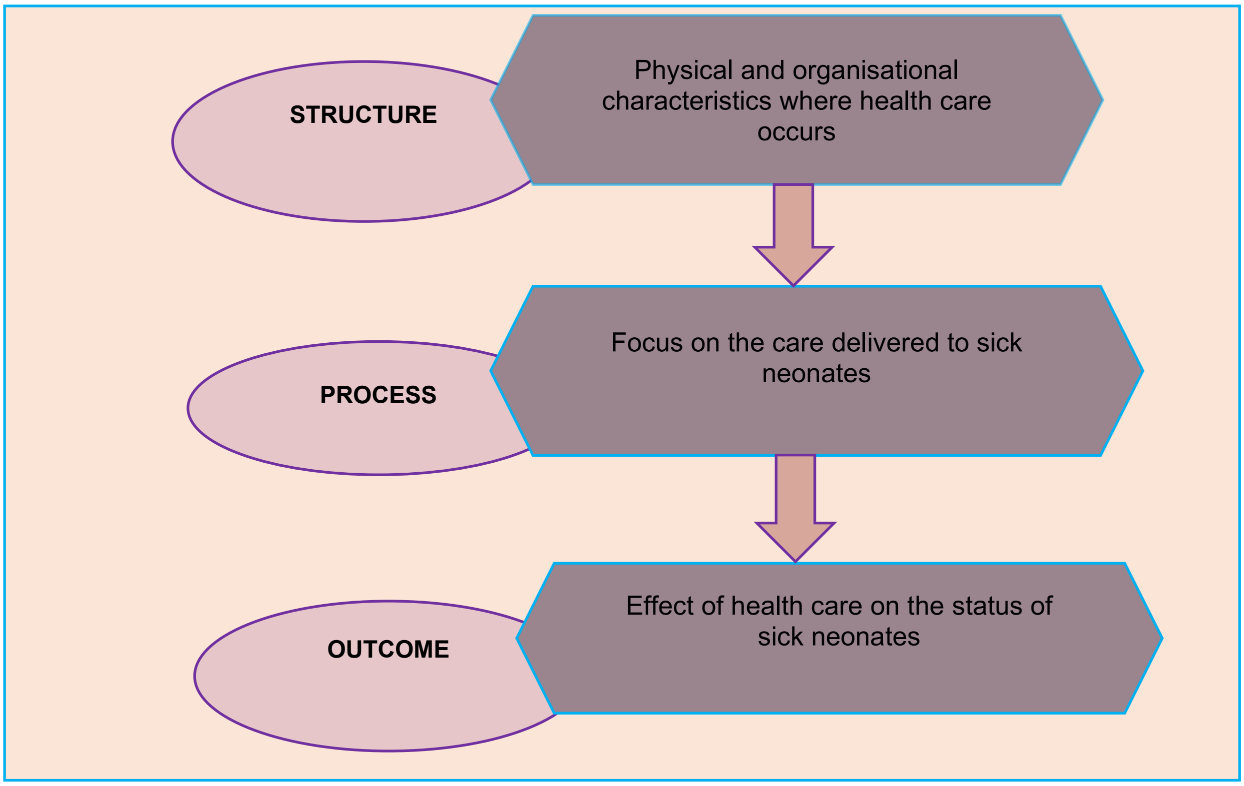

Figure 2.1: Donabedian quality of care model (adapted from Donabedian, 2005)

- *Physical and organisational characteristics where health care occurs*

According to Donabedian (2005), structure refers to relatively static characteristics of the midwives who care for and are of the settings where the care is delivered. In this study, physical characteristics will include midwives' (education, training, experience and certification) and organisational characteristics will refer to adequate staff, equipment, safety devices and NICUs. Structure measures show the attributes of the service provider such as staff to patient ratio and operating times of the service. Furthermore, the Donabedian's Quality of Care Model concludes in its component "structure" that high quality of care could be delivered only if the human and material resources are allocated and if the infrastructure and work environment are adequate (Donabedian, 2005).

- *Focus on the care delivered to sick neonates*

Process indicates all the activities taking place during the delivery of care to the sick neonates (diagnosis, interventions). Process measures reflect the way the systems and processes function to deliver the intended outcome. In this study, care delivered to sick neonates includes the length of time a sick neonate waits for a senior clinical review, if sick neonates receive certain standards of care or not, if staff wash their hands, recording of incidents and acting on the findings and whether the parents of the sick neonates are kept informed of the delays when waiting for an appointment or certain care. Moreover, process measures are important in quality improvement as they describe whether clinical care has been properly applied (Donabedian, 2005).

- *Effect of health care on the status of sick neonates*

Outcome refers to changes due to health care services, which appear by improving the knowledge and health status of the sick neonates, as well as the satisfaction of their parents with health care services. Outcome measures indicate the influence on the sick neonates and display the end results of the improved work and whether it has ultimately achieved the goals of care. In this study, effect of health care on the status of sick neonates will refer to reduced or increased mortality, reduced length of stay and nosocomial infections, reduced adverse effects and emergency admissions (Donabedian, 2005).

2.7.2 *Practice-Oriented Theory*

Practice-Oriented Theory is a goal-directed and order of the required actions that are essential to yield the needed outcomes (Dickoff., James & Wiedenbach, 1968). Dickoff et al. (1968) maintain that if a Practice-Oriented Theory is developed centred on empirical evidence, it guides practice. Practice-Oriented Theory guided the process of development of a model for midwives who care for sick neonates in NICUs (figure 6.1). In addition, Chin and Kramer (2008) and Walker and Avant's (2011) steps for model or theory construction and validation will be used respectively.

The researcher perceived Practice-Oriented Theory as a framework through which neonatal care can be improved in the NICUs. The main concepts of the study identified in Figure 2.2 were classified according to the survey list developed by Dickoff et al. (1968) and defined according to a dictionary and subject definitions. The survey list highlights six activity aspects which include ways of looking at provision of quality care to the sick neonates. All aspects of the activity list are important and should, thus, be considered to obtain a full exploration of the challenges of midwives regarding provision of neonatal intensive care. Six questions relating to the activity aspects are used to survey activity and these include:

1) Context: In what context is the activity performed?

2) Agent: Who or what performs the activity?

3) Recipient: Who or what is the recipient of the activity?

4) Procedure: What is the guiding procedure, technique or protocol of the activity?

5) Dynamics: What is the energy source for the activity?

6) Terminus: What is the endpoint of the activity?

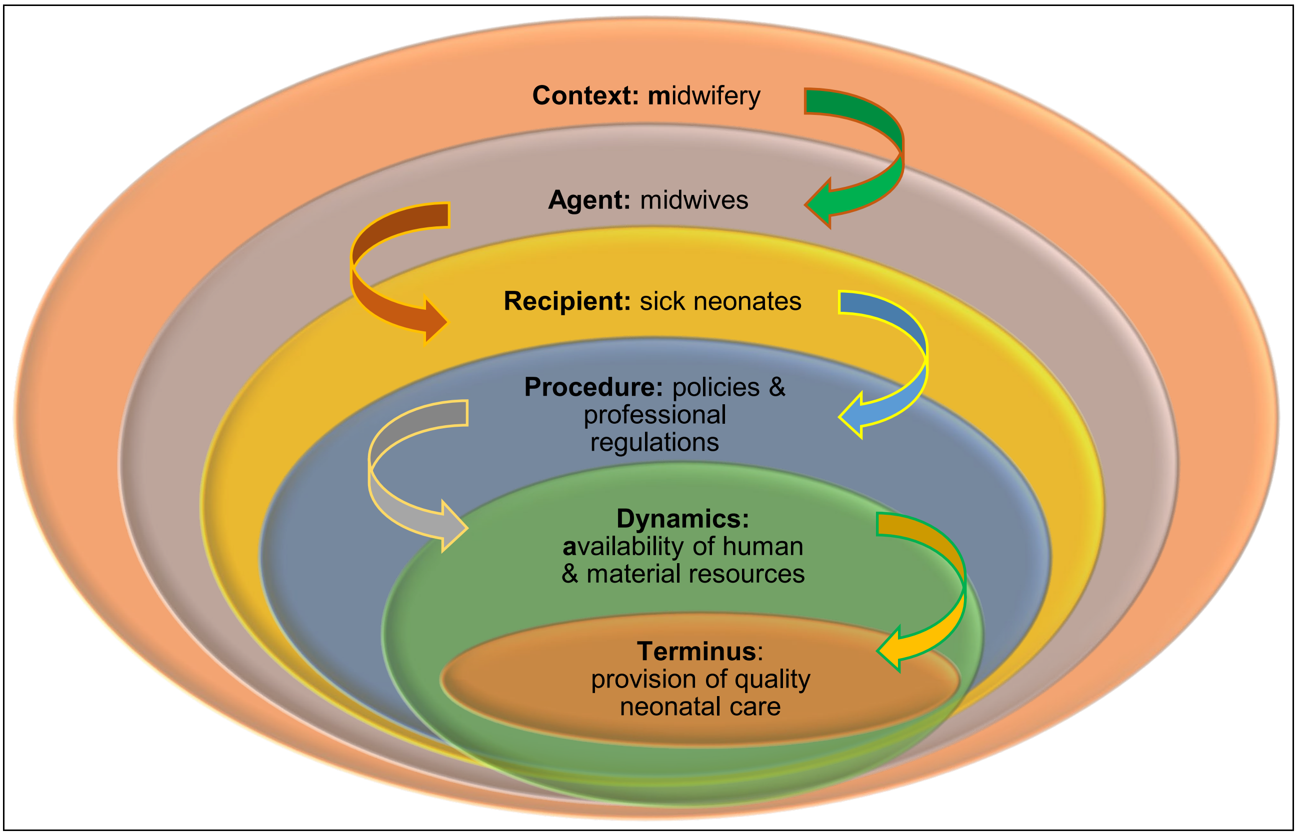

Figure 2.2 : Practice-Oriented Theory (adapted from Dickoff et al. 1968)

An explanation is given below of how the general concepts and the main concepts were used to answer the questions in the survey list of Dickoff et al. (1968):

- *Context*

Dickoff et al. (1968) refer to the context as “in what context is the activity performed”? The activity is performed in the NICUs. The NICU is a hospital care unit that specialises in providing neonatal care to small and sick neonates. In this study, NICU refers to a neonatal unit that specialises in admitting and providing Level II and Level III care to small and sick neonates.

- *Agents*

Dickoff et al. (1968) refer to the agent as “who or what performs the activity”? In this study, the primary agents are the Midwives allocated in the NICUs of Limpopo Province regional and tertiary hospitals who will be responsible for the facilitation of the model for midwives who care for sick neonates. The term ‘midwife’ refers to a person registered under Section 31 of the Nursing Act No 33 of 2005, who supports, cares for, and treats a health care user to achieve or maintain health where this is not possible (*Nursing Act No 33 of 2005*).

- *Recipient*

Dickoff et al. (1968) refer to the recipient as “who or what is the recipient of the activity”? The recipients in this study are the sick neonates who receive neonatal care directly from the midwives. Agents should ensure that the recipients receive high quality neonatal care. Therefore, the agents need to be empowered to provide high quality neonatal care to their recipients.

- *Procedure*

Dickoff et al. (1968) refer to the procedure as the path, steps or general patterns on the way to the accomplishment of a goal. In addition, procedure is referred to as a process that is employed to address certain problems or guide the actions to validate the model. This study involves the provision of quality neonatal care which is the second phase of the developed model. The provision of quality care focuses on the following benefits, namely: reduced costs and improved quality care.

- *Dynamics*

Dickoff et al. (1968) refer to the dynamic as “what energy source”? The results of the semi-structured interviews and questionnaire revealed compromised quality neonatal care to small and sick neonates.

- *Terminus*

Dickoff et al. (1968) states that 'terminus' encompasses the questions to the procedure as the path, steps or general patterns on the way to the accomplishment of a goal. What will be the aim of developing a model for midwives who care for sick neonates in NICUs in selected public hospitals, Limpopo Province? The model aims to facilitate provision of quality neonatal care to the sick neonates. The terminus is the third phase of the model of care. In this study, terminus is the outcome for provision of quality neonatal care in the NICUs.

2.8 Summary

This chapter discussed literature review on quality neonatal care in Neonatal Intensive Care Units. A narrative literature review was conducted. Electronic searches were done in the following databases: Science Direct, Sabinet, Emerald, PubMed and also the Google scholar from 2012 till 2020. The search terms used were: quality care, neonatal intensive care unit, neonatal mortality, neonatal care, neonatal mortality, and factors, model of neonatal care. The reviewed literature included the following: description of quality of neonatal health care services, interventions for small and sick neonates, neonatal respiratory conditions associated with neonatal mortality and factors influencing neonatal mortality in NICU. The models guiding provision of neonatal care were reviewed. The two theories used to guide this study namely: Donabedian's Quality of Care Model (Donabedian. 2003) and the Practice-Oriented Theory of Dickoff et al. (1968) were discussed. Chapter 3 will discuss the research methodology used for the study, the data collection instruments, pretesting of data collection instruments, as well as ethical considerations.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter focuses on the research methodology and design, the essence of mixed - methods research, criteria of selecting an appropriate mixed - methods strategy and the rationale for the mixed - methods approach. The explorative mixed-method design and the purpose of choosing the design is discussed in this study.

3.2 Mixed - method approach

The mixed - methods approach which is the combination of the qualitative and quantitative approaches was used in this study. Creswell, (2014b) defines mixed - method research as a design with philosophical assumptions as well as methods of inquiry, with involves both collecting and analysing qualitative and quantitative data, meaning both numeric and text information were collected. The core assumption of this form of inquiry is that the combination of qualitative and quantitative approaches provides a more complete understanding of a research problem than either approach alone. Therefore, an exploratory sequential mixed - method design was used in this study.

3.3 Exploratory sequential mixed - method design

Creswell (2014) explains exploratory sequential mixed - method design as consisting of first gathering qualitative data to explore the phenomenon, and then collecting quantitative data to test relationships found in the qualitative data. A popular application of this design is to explore a phenomenon, identify themes, design an instrument and subsequently test it. Furthermore, this design allows the researcher to identify measures grounded in the data obtained from study participants. Qualitative data collection and analysis were done to explore the phenomenon, identify themes, design a data collection instrument, and pre-test it (Jakobsen, Gluud & Winkel, 2017).

The findings of qualitative phase were used to develop the quantitative data collection tools, thereafter, quantitative data collection and analysis was then carried out. The priority is usually given to the qualitative data and the two methods are integrated during the interpretation phase. The aim of this design was to use quantitative results to assist in explaining and interpreting the findings of initial qualitative results from the first phase of the study. The qualitative results informed the types of respondents selected for the quantitative phase and the types of questions that were asked of the respondents, thus it assisted in the development of the questionnaire and checklist (Creswell, 2014).

Figure 3.1 illustrates the schematic presentation of the process of the exploratory sequential mixed - method design. The presentation provides an overview by utilising a series of interrelated blocks.

3.4 Phase 1: Empirical phase

The empirical phase was conducted in sections of qualitative and quantitative as shown in Figure 3.1

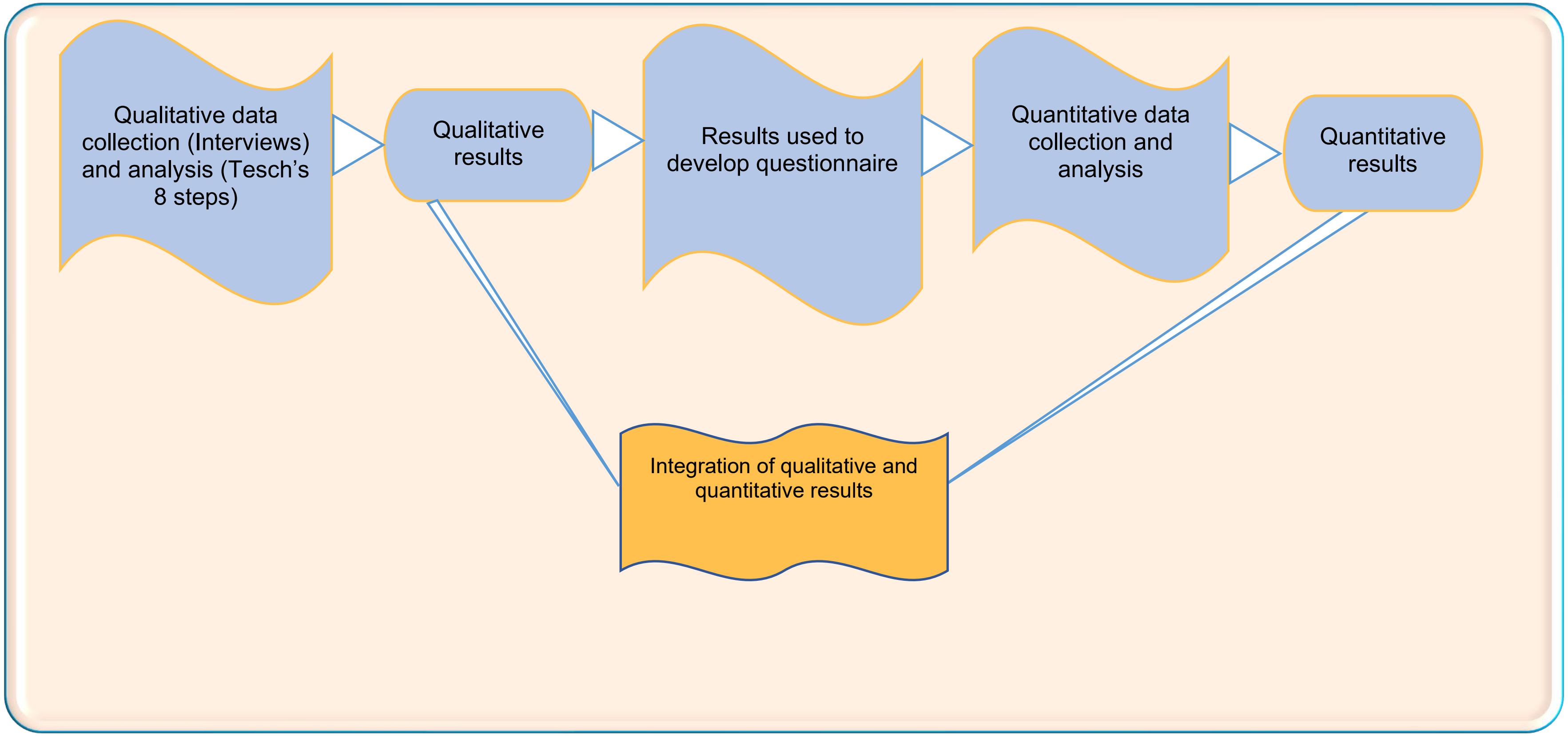

Figure 3.1: Exploratory Sequential Mixed - method Design (adapted from Creswell, 2014))

3.5 Study settings

The Limpopo Province is a South African province situated in the far North part of the country bordering Botswana, Zimbabwe and Mozambique. It is known for bushveld and wildlife reserves, including Kruger National Park. The area is dominated by rural areas with some semi-urban areas. It is divided into five districts, namely, Capricorn, Mopani, Waterberg, Sekhukhune and Vhembe. According to Statistics SA (2016), Limpopo Province has a population of about 5.8 million people, which makes it the fifth largest province in the country based on the population size.

The study was conducted in all five districts of Limpopo Province the Limpopo Province. Hospital G is situated in Sovenga Township, 30km East of Polokwane City in the Capricorn district. It has a 60- bedded NICU which provides care to 90 to 100 sick neonates per month, with 13 to 15 deaths per month. Hospital A is situated in Tzaneen, Lydenburg Road of the Mopani district. It is located 13.2 kilometres (km) South-East of Tzaneen on the R36 and 105 km west of Phalaborwa along the R71 and R36. It has a 15 bedded Neonatal Unit, caring for 40 to 50 sick neonates per month, with 4 to 5 deaths per month. Hospital E is situated 3 km away from Mokopane town in the Waterberg district. It consists of a 28 bedded Neonatal Unit, caring for 45 to 50 sick neonates per month, with 5 to 6 deaths per month.

Hospital S is located in Nebo Street, Glen Cowie next to R579 road to the South of the hospital in Sekhukhune district. Glen Cowie is located 66.4 km North-East of Groblersdal and 135 km South-East of Mokopane. It has a 19 bedded Neonatal Unit which provides care to 45 to 55 sick neonates per month, and 5 to 6 deaths per month. Hospital I is situated in Phandamaria Main Road, Shayandima next to R524 to the South of the hospital in Vhembe district. Shayandima is located 11.2 km South-West of Thohoyandou and 63.8 km East of Louis Trichardt. The 27 bedded Neonatal Unit caters for 50 to 60 sick neonates per month, with 6 to 7 deaths per month. The researcher chose these settings because they offer Level II and III neonatal intensive care. Moreover, they serve as the experiential learning institutions for undergraduate and postgraduate learner nurses from University of Limpopo and Limpopo College of Nursing.

The following hospitals namely: Hospital A, Hospital E, Hospital S and Hospital I are level II hospitals which also cater for sick neonates from the surrounding district hospitals. The neonates who need more advanced care are transferred to Hospital G in the Capricorn district which is the only Level III hospital providing for neonatal intensive care at Level III.

- *Levels of care*

According to DoH (2015), there are 3 levels of hospital care namely, Level I, Level II and Level III.

- *Level I hospital*

Level I hospital provides health care to the rural areas and should be well staffed with advanced midwives, midwives, professional nurses, enrolled nurses, enrolled nursing assistants, allied workers, full-time medical officers and visiting specialist obstetricians. It also provides antenatal care services to women who are regarded as at high risk, such as those with pregnancy induced hypertension disorders and gestational diabetes (DoH, 2015).

- *Level II hospital*

Level II hospital provides care at the regional level, and it caters for communities in a number of districts. Moreover, it serves as a referral hospital for Level I hospitals, nearby clinics and community health centres, moreover, it is capable of rendering care for sick neonates. It should be staffed with advanced midwives, midwives, professional nurses, enrolled nurses, enrolled nursing assistants, allied workers, full-time medical doctors, full-time specialist obstetrician and full-time specialist paediatrician. In addition, it should have intensive care units (DoH, 2015).

- *Level III hospital*

Level III hospitals provide care at a tertiary level, and has all the functions of Level I, specialist clinics, advance prenatal diagnosis, management of very ill obstetric patients as well as critically ill neonates. It should be staffed with all the health care workers in Level I and Level II hospitals, full-time obstetricians, full-time paediatricians and full-time neonatologists (DoH, 2015).

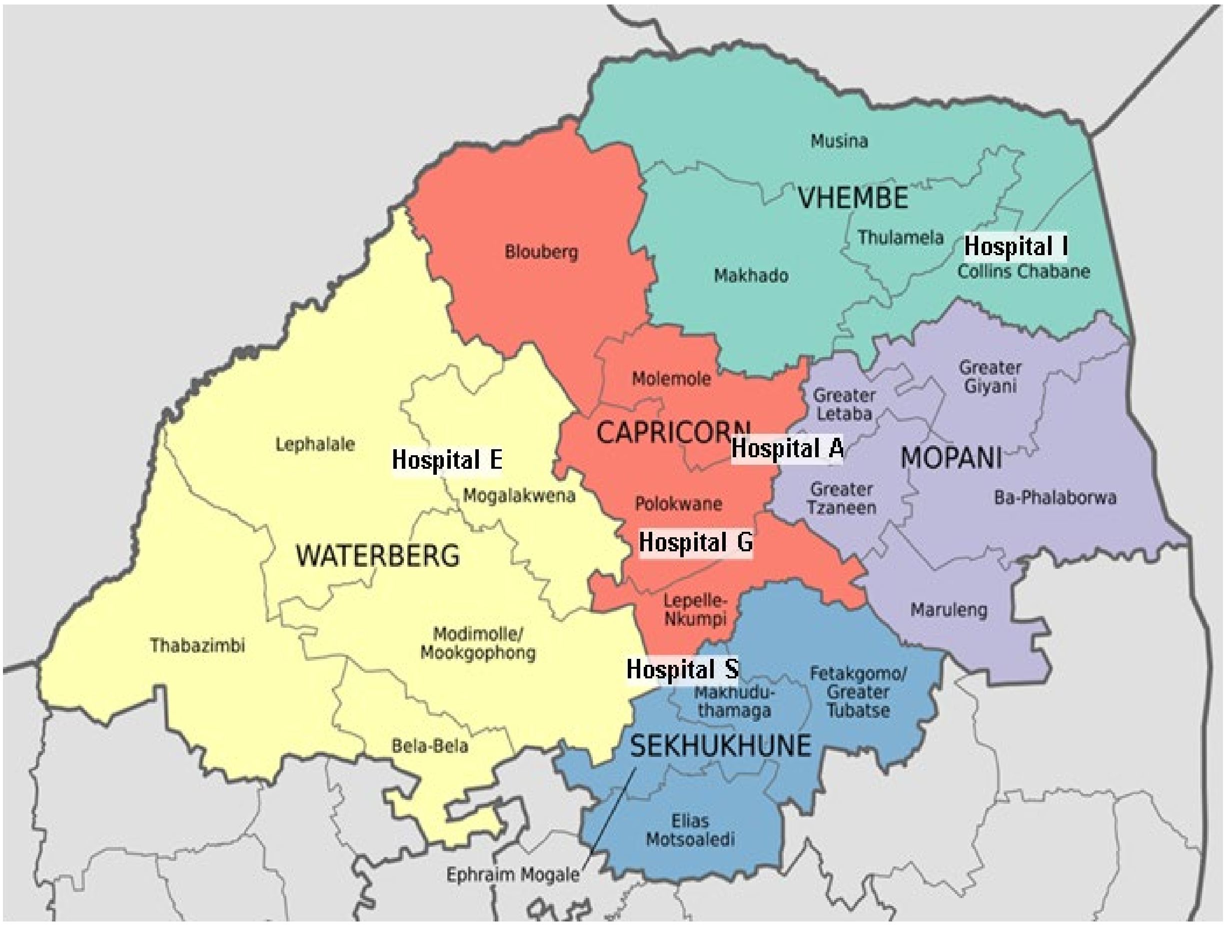

Figure 3.2: Map of Limpopo province indicating the five hospitals (Malangu and Lekgothoane, 2013)

3.6 Part 1 of empirical phase: Qualitative phase

Qualitative research method is defined as an investigation of phenomena, typically in an in-depth and holistic manner, through collection of narrative materials utilising flexible research design (Polit & Beck, 2021). According to Creswell (2014), it is effective in obtaining culturally specific information about values, opinions, behaviours, and social context of a particular population. Moreover, it provides information about the participant side of an issue that is usually contradictory to behaviours, beliefs, emotions, opinions and relationship of the individuals. In this phase, the qualitative approach was used to allow the participants to describe their experiences regarding the quality of neonatal care.

3.6.1 Purpose of the qualitative phase

The qualitative phase was used to provide insights into people's lifestyle behaviour, lived experiences, their knowledge, feelings, attitudes, opinions and values, through explorations and in-depth in a natural setting.

3.6.2 Objective of the qualitative phase

The objective of qualitative phase was to:

- Explore the challenges of midwives regarding the neonatal care they provide to sick neonates in NICUs of public hospitals, Limpopo Province.

3.7 Population and sampling

For the purpose of meeting the research objectives of the phenomenon under study, the population should be identified, and the sample should be the representative of the study population, whereby the characteristics are common (Polit & Beck, 2021).

3.7.1 Population

Population, is defined by Polit and Beck (2021), as a complete set of persons who possess some common characteristics that are of interest to the researcher. According to Botma et al., (2016) the target population is the entire set or aggregation of objects, persons, behaviour or events, or any other single unit of a study sometimes called elements or sampling units, that meet the sampling criteria. The population was all the midwives allocated in the NICU of Hospital G and Hospital A of Limpopo Province. The researcher asked for the unit managers to assist with the number of midwives allocated in their units. Therefore, the monthly allocation list was used in order to determine the target population. The researcher opted for the midwives as the population of the study because most of the nurses working in NICUs were not specifically trained in neonatal care but registered as the midwives with SANC. The two hospitals were purposefully selected for qualitative phase because of the limited number of the midwives in all the hospitals, therefore, the other hospitals were used in quantitative phase. In addition, Hospital G was used in both phases as an overall transfer hospital and also that it had more midwives that the other four (4) hospitals. The total population size was 58 midwives as indicated in Table 3.1.

Table 3.1: Target population of midwives for qualitative phase

District	Hospital	Midwives
Capricorn	Hospital G	46
Mopani	Hospital A	12
Total		**58**

3.7.2 Inclusion criteria

Inclusion criteria was:

- Midwives who were registered with the SANC and permanently employed in NICU.
- Midwives who had six months and more experience in neonatal intensive care.

3.7.3 Exclusion criteria

Exclusion criteria was:

- Midwives registered with SANC, having less than 6 months of NICU experience, because they did not have enough experience in NICU.
- Midwives who were on leave and off duty during data collection, as they were not in the context for the study.
- Midwives who refused to give consent to participate in the study.

3.8 Pilot study

Prior to the use of the semi-structured interview guide, it was pretested on five (5) midwives who were allocated in NICU to determine how well the data collection instrument, methods and interviews would work practically. The researcher contacted the hospital management to request to conduct a pilot study after the ethical clearance was granted. The hospital management and NICU unit manager in Hospital G granted the permission to conduct a study. The researcher and the unit manager agreed on the date which the researcher went to conduct a pilot study. The hospital was selected as it was convenient for the researcher and also had a larger population than the other four (4) hospitals. The purpose of the study and the visit was indicated to the midwives, who later gave a verbal consent and also formed consent form to sign. A central question and two probing questions were rephrased after the pilot study to improve clarity regarding the information being sought.

The initial central question was:

” *Could you tell me about the quality of neonatal care for sick neonates in your unit?*”

The participants seemed not to clearly understand when asked to tell the researcher about the quality of neonatal care for sick neonates in their units.

The question was then rephrased to

“*Could you please tell me about the challenges you encountered when rendering neonatal health care services to sick neonates in your unit”?*

The initial probing questions were as follows:

1. “*What are your experience with regard to the quality of neonatal care in your unit”?*
2. “*What is the impact of the quality of neonatal care on neonatal mortality in your units”?*

The rephrased probing questions were as follows:

1. *Could you please tell me more?*
2. *What is the impact of the quality of neonatal care on neonatal mortality in your unit?*

3.9 Qualitative sampling

Sampling is a process in which representative units of a population are selected for inclusion in a research investigation (Creswell, 2014). According to Polit and Beck (2021), a sample is a subset of a large set selected by the researcher to participate in a research study. Non-probability criterion purposive sampling was used in this study to select the two public hospitals from the five districts, because they offer neonatal intensive care to sick neonates. It is also referred to as judgmental sampling because is based on the judgement of the researcher, in that a sample is comprised of elements that contain the most characteristics, representatives or typical attributes of the population that serve the purpose of the study best. The duty roster was used to purposefully select the participants. The total sample size was 17 participants. Five (5) were used for the pilot study and 12 were used in the actual study. Hence, the final study sample size was 12 participants and was determined by data saturation (Botma et al., 2016).

3.10 Qualitative data collection

The data collection process involves the generation of a large amount of data required to address the research problem (Sutton & Austin, 2015). The purpose of data collection was to obtain information to keep on record, to make a decision about important issues, and to pass that information to others.

3.10.1 Preparation for data collection

The researcher visited the selected public hospitals (one per district) to request permission from the Chief Executive Officers. After obtaining the permission, Nursing Managers were approached for further permission and to explain purpose of the study and the desired population. The Nursing Manager assigned someone for accompaniment to the NICU for further arrangements. The researcher engaged with the midwives on duty on that day and delineated the purpose, objectives and the significance of the study and also requested them to participate in the study. The day for the interviews was agreed upon with the midwives and the unit manager was informed of the date.

3.10.2 Data collection procedure

Prior to conducting the one-on-one semi-structured interviews, the researcher informed the participants that the audio recorder will be used and requested for permission to use it. Confidentiality and anonymity were emphasised, participants were told not to say their names, surnames and also the names of the hospitals. The purpose of the study was outlined to the participants so that they can have an idea of what is expected of them. Prior to the interviews, the participants were requested to sign an informed consent form as an indication of granting the permission to participate in this study. Twelve (12) interviews were conducted at the two selected public hospitals in private rooms.

3.10.3 Semi-structured interviews

The semi-structured interviews were conducted with midwives allocated in NICUs. By using semi-structured interviews, the researcher sought to capture the challenges experienced by midwives' when rendering neonatal care in NICUs (Hennink, Hutter & Bailey, 2011). The interviews were conducted at the two NICUs, which are situated within the five districts of Limpopo Province, which assisted the researcher to identify the context where sick neonates received neonatal care. The semi-structured interview guide (Appendix I) was developed by the researcher based on the neonatal care and challenges encountered by midwives when rendering neonatal care to sick neonates in NICUs.

The interview guide consisted of central question and probing questions. The researcher first asked the central question, followed by probing questions and follow-up questions for clarity. The central question was "Could you please tell me about the challenges you encountered when rendering neonatal health care services to sick neonates in your unit?" Probing questions were asked to encourage the participants to provide clarity and further information to assist the researcher to understand the participant's point of view. The interview guide was used to collect data through one-to-one semi-structured interviews in public hospitals. An audio tape recorder was used to capture the data, non-verbal cues were recorded during the interviews and field notes were written with the permission from the participants.

The researcher visited each NICU and spent a morning at each NICU interviewing midwives about their challenges when rendering neonatal care to sick neonates. Each NICU was able to provide the researcher with a private room in which to conduct and audio record the interviews. Consent was obtained from each participant who agreed to participate in the study (Appendix XVI). Consent form was signed by each midwife which included consent to audio record the interviews for the purpose of verbatim transcription and data analysis. Included in this consent was the participants' agreement for the use of anonymous quotes to be used in the research report.

The interviews were conducted in English. The interviews were conducted in a closed room, thus ensuring confidentiality for each participant, so that their responses were not heard by anyone else in the NICU. In order for the researcher to create rapport with each participant, the researcher and participant sat facing each other with no barrier in between them. The researcher asked a few general questions leading to small talk to help establish rapport and create a relaxed environment, the interview commenced afterwards. The duration of each interview session was approximately 30-35 minutes to gather in-depth information (De Vos et al., 2011). Data was collected over a period of two months since the participants were shift workers. Data was collected until data saturation was reached. The interviews were transcribed verbatim shortly after each interview to ensure maximum recall of the experience.

- *Probing*

Probing was done to obtain more useful information than the participants volunteered during their initial reply (De Vos et al., 2011). The probing questions were asked to encourage the participants to give in-depth and clearer information. The participants were able to give more information when the researcher probed.

- *Clarification*

The interview questions were set in a simpler way for participants to understand.

3.11 Qualitative data analysis

Quantitative data analysis was used to gain a broader understanding of the quality of neonatal care (De Vos et al., 2011). According to Creswell (2014), the researcher must pay careful attention to the qualitative data analysis steps and determine what findings to build on. Themes and sub-themes were used to analyse data.

Tesch's eight steps in the coding process (Creswell, 2014) was used to analyse data. The following steps were followed:

Step 1

Tesch suggests that in step one the researcher needs to become familiar with all the data. The researcher transcribed the data which made reading through it easier. By reading through the data a couple of times the researcher was able to get a sense of the whole concept of neonatal care from the interviewees' responses.

Step 2

Tesch suggests essential coding. The researcher again read through each interview and identified topics which were written in the margin of the transcript.

Step 3

The researcher reviewed the topics identified, and formatted them onto one document with columns, in which common or similar topics were written. The researcher then began clustering the topics and naming those clustered topics.

Step 4

The researcher organised the topics by checking it against the data to ensure the list of topics were relevant and represented the data. During this process, changes were made to the names of the topics and groupings after which the data was coded line-by-line according to the codes and themes agreed upon at this stage with the supervisor and independent coder.

Step 5

Tesch suggests refining the organising system. This was done and final decisions made about naming the themes after which the data was mapped.

Step 6

Tesch suggests the naming of the themes and the assignment of abbreviated codes for easy management of the data.

Step 7

Once coding was complete, the researcher commenced preliminary analysis by looking at the data by one theme at a time. By re-reading the quotes that had been put into a theme, it was possible to develop an in-depth understanding of what was being said in relation to the theme. During this stage, the researcher regularly checked the research question to ensure the relevance of the data and the appropriateness of the analysis.

Step 8

Involves refining the organisational system and themes which may lead to recoding some data. As the decision was taken early in the study to use the themes arising from the midwives' interviews as a template for analysing the data from the midwives, there were inevitably some changes made to the final organising system, which were then useful, collectively, in addressing the outcome of the study.

3.12 Measures to ensure trustworthiness

3.12.1 Trustworthiness

Trustworthiness is defined as the rigor of the qualitative research study. Moreover, it is the means of demonstrating the plausibility, credibility and integrity of the qualitative process. Trustworthiness measures the degree to which the results of the research are authentic, accurate and credible (LoBiondo-Wood & Haber, 2010). Trustworthiness was ensured by adhering to the following measures:

- *Credibility*

Credibility is the alternative to internal validity, in which the goal is to demonstrate that the inquiry was conducted in such a manner as to ensure that the subject has been accurately identified and described (De Vos et al., 2011). Credibility was ensured by gathering information from the participants without assisting them and being biased. Detailed description of the phenomenon under study can be a greater provision for upgrading credibility as it assists to transfer the actual situation under study, and to an extent, the settings that surround them. Triangulation which includes audio recording of semi-structured interviews and field notes and were used in this study.

In addition, when same findings transpire at various settings, credibility may be substantial in the eyes of the reader. Prolonged engagement among the participants and the researcher was utilised to attain sufficient understanding of the setting or to build rapport. Moreover, sufficient time was granted to the participants to express themselves. Peer scrutiny chance by academics, peers, school and faculty higher degrees' committees was permitted. Additionally, the subject experts in the field of study reviewed the process of sampling, data collection and analysis, and also explore audio recordings or field notes (Moule & Goodman, 2014).

- *Member checking*

Member checks, also known as participant validation, is a method for exploring the credibility of results. Each participant's word was included in the analysis and interpretation of data. The participants were asked to check or read any transcripts of their interviews in which they have participated to ensure accuracy. Furthermore, confirmation of the researcher's transpiring theories and conclusions which may be formed during the interviews (Birt, Scott, Cavers, Campbell & Waiter, 2016).

- *Dependability*

Dependability is the alternative to reliability, in which the researcher attempts to account for changing conditions in the phenomenon chosen for the study as well as changes in the design created by an increasingly refined understanding of the setting (De Vos et al., 2011). In this study, dependability was ensured by spending time with the participants until there was data saturation. The processes within the study were indicated in detail to make it possible for future researchers to repeat the research, if not importantly to get the similar findings. Furthermore, the interviews were audiotaped, transcripts and tapes were kept under lock and key where only the researcher had access. Stepwise replication was used where the researcher and independent coder analysed the same data separately and compare results. The analysed results were the same, therefore dependability was attained (Moule & Goodman, 2014).

- *Transferability*

Transferability is concerned with the extent to which the research findings can be transferred from one context to another by providing valid descriptions of the data, and also identifying sampling and design details. Transferability was ensured by providing sufficient thick description of the phenomenon under study to allow the readers to have a good understanding of it. Furthermore, descriptions were supported by direct quotations from the participants and a literature control to evaluate the applicability of the data to other contexts. In addition, the researcher ensured that enough contextual information regarding the fieldwork settings was provided to allow the reader to make such a transfer. Moreover, triangulation was used converging the qualitative and quantitative data which were collected sequentially from different samples (Moule & Goodman, 2014).

- *Confirmability*

Confirmability refers to the steps that are being taken to help ensure, that the findings are the results of the experiences and ideas of the participants, rather than the characteristics and preferences of the researcher (Moule & Goodman, 2014).

Confirmability is concerned with establishing that the data represent the information provided by the participants, and that the interpretations of those data are not inverted by the inquirer. An audit trail was kept of the entire research process and making audiotape recordings available to the supervisors. An audit trail allowed the researcher to keep an account of all the research decisions and activities and to show how the data were collected, recorded and analysed. The researcher ensured that the findings reflect the participants' voice and the conditions of the inquiry, not the researcher's biases, motivations or perspectives. Detailed descriptions of the methodology was provided to make it possible for the reader to establish how far data and contrast transpiring from it, may be approved. The findings were supported by literature control (Polit & Beck, 2012).

3.13 Part 2 of empirical phase: Quantitative phase

Quantitative research is the process of testing relationships, differences, and cause and effect interactions among and between variables (LoBiondo-Wood & Haber, 2010). According to Moule & Goodman (2014), quantitative research method is an approach that emphasises the collection of numerical data and the statistical analysis of hypothesis proposed by the researcher. Quantitative research focuses on a small number of concepts and strives to generalise research results to larger contexts (Botma et al., 2010). In the context of this study, the researcher used the quantitative research method to obtain information about the quality of neonatal care in the public hospital, Limpopo Province.

3.13.1 Purpose of the quantitative phase

The purpose of quantitative phase was to identify the variables of the study, and to specify how variables would be measured, related and described.

3.13.2 Objective of the quantitative phase

The objective of quantitative phase was to:

- Assess the factors influencing the care for the sick neonates in NICUs of public hospitals, Limpopo Province.

3.14 Population and sampling

According to Polit and Beck (2012), the population is not restricted to human beings only, but it may include hospital records and blood samples. The sample is usually drawn from the accessible population which has specific characteristics.

3.14.1 Population

Population is defined by LoBiondo-Wood and Haber (2010) as a well-defined set that has certain specific properties or characteristics that are of interest to the researcher. According to Botma et al. (2010), the target population is the entire set or aggregation of objects, persons, behaviour or events, or any other single unit of a study sometimes called elements or sampling units, which meet the sampling criteria. The population was all the midwives (82) allocated in the NICU of Hospital G, Hospital I, Hospital E and Hospital S of Limpopo Province.

Table 3.2: Target population of midwives for quantitative phase

District	Hospital	Midwives
Capricorn	Hospital G	46
Vhembe	Hospital I	14
Waterberg	Hospital E	12
Sekhukhune	Hospital S	10
Total		**82**

3.14.2 Inclusion criteria

Inclusion criteria was:

- Midwives who were registered with the SANC and permanently employed in NICU.
- Midwives who had six months and more experience in neonatal intensive care.

3.14.3 Exclusion criteria

Exclusion criteria was:

- Midwives registered with SANC, having less than 6 months of NICU experience, because they did not have enough experience in NICU.

- Midwives who were on leave and off duty during data collection, as they were not in the context for the study.
- Midwives from Hospital G who participated in the qualitative phase.

According to Creswell (2014), sampling was guided by the qualitative results (Creswell, 2014). Non-probability criterion purposive sampling was used in this study to select the four public hospitals from the five districts, because they offer neonatal intensive care to sick neonates. Systematic random sampling was used to sample the midwives in NICUs of the public hospitals, and every midwife had a chance of being included in the study.

Slovin’s formula (Yamane, 1967) for calculating sample size was used:
n = sample size
N = population size
e = error of margin (0.05)

$$\boldsymbol{n} = \frac{\mathbf{N}}{\mathbf{1+}\boldsymbol{Ne}^{2}}$$

$$\boldsymbol{n} = \frac{\mathbf{82}}{\mathbf{1+82(0.05)}^{2}}$$

$$\boldsymbol{n} = \frac{\mathbf{82}}{\mathbf{1+82(0.0025)}}$$

$$\boldsymbol{n} = \frac{\mathbf{82}}{\mathbf{1.205}}$$

$$\boldsymbol{n} = 68$$

Figure 3.3: Sample size of Midwives

3.16 Quantitative data collection

Considering the results, categories as variables, quantitative data collection tools were developed (Creswell, 2014). A self-administered questionnaire was constructed after reviewing related literature and also by utilising the qualitative phase results. The questionnaires were piloted before the main study commenced. The questionnaire pre-test was conducted in a different setting and refined accordingly. The researcher and the research assistant delivered the questionnaires to the sampled respondents at the selected public hospitals. The questionnaire comprised of 38 items and two sections namely: Section A: socio-demographic data, factors influencing the quality of neonatal care for the sick neonates in NICUs. Section B, B1: neonatal resuscitation, B2: main causes of neonatal mortality, B3: factors that lead to poor neonatal quality care and B4: neonatal interventions for sick neonates. The duration for completion of questionnaires was approximately 40-45 minutes. The respondents completed the questionnaires on their own in a private room in the presence of the research assistant, however, the researcher was available for clarity

3.17 Reliability and validity

The quality of data collection instrument is indicated by its reliability and validity. Reliability deals with the consistency of the data collection tool, while validity of an instrument is defined as an indication of how well the instrument measures what it is supposed to measure and performs as it is designed to perform (Burns & Gray, 2013)

3.17.1 Reliability

Reliability refers to the degree to which the research instrument can be depended upon to yield consistent results if used repeatedly over time on the same person, or if used by two researchers (De Vos et al., 2011). Creswell (2014a) mention that techniques such as stability, interrater reliability, internal consistency and the calculation of the Cronbach's alpha infer the reliability of an instrument. According to Botma, Greeff and Mulaudzi (2016), the reliability of an instrument can be determined by the following tests:

Stability: refers to the test that examines the extent to which scores from one sample are stable overtime from one test administration to another. In addition, to achieve this form of reliability, tests should be administered at two different times to the same respondents at a sufficient time interval.

Interrater reliability: is measured when two observers measure the same behaviour or event and their observations are compared. The observers record their scores and then compare the scores to see if they are similar or different.

Internal consistency: means the scores from an instrument are reliable and accurate if an individual's scores are internally consistent across the items of on the instrument. This means the items in an instrument measure the same.

Cronbach's alpha which is a coefficient that ranges between zero (0) and one (1) was used to determine the internal consistency of the instrument for interval and ratio level data. The results of Cronbach's Alpha was $\alpha = 0.698$. Therefore, the data collection instrument was reliable. In addition, Cronbach's alpha is commonly used when the questionnaire has Likert questions and want to establish whether the scale is reliable or not.

Pilot study which is a mini study was done to pre-test the aspects such as useability of the questionnaire and recording forms (Botma et al., 2016). The reliability of the instrument was also established by accurate and careful phrasing of each question to avoid ambiguity, and leading respondents to a particular answer.

3.17.2 Validity

According to Babbie and Mouton (2011) , validity refers to the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration.

- *Content validity*

Content validity is an assessment of how well the instrument represents all the components of the variable to be measured. Validity was ensured by the components with which items covered the quality of neonatal care, resuscitation, factors that lead to poor neonatal quality care and causes of neonatal mortality (De Vos et al., 2011; Grove., Burns & Gray, 2013). Validity of the instrument was ensured by conducting an intense literature review on quality of neonatal care, neonatal resuscitation outcomes of neonates. Furthermore, validity was ensured by presenting the self-developed data collection instruments to a panel of experts in the field of study, including supervisors, advanced midwives and NICU trained nurses to evaluate for content validity of the instrument (Babbie & Mouton, 2011).

- *Face validity*

Face validity is a subjective determination that an instrument is adequate for obtaining the desired information. On the surface or the 'face', the instrument appears to be an adequate means of obtaining the desired data (De Vos et al., 2011). The data collection instruments were submitted to experts in the field of study to be checked for the ability to measure what it was expected to measure. The instruments were checked whether they contain the relevant items to be measured; and also the instructions and headings to guide the respondents (Moule & Goodman, 2014).

- *Construct validity*

Construct validity is based on the extent to which a test measures a theoretical construct, attribute or trial. It attempts to validate a body of theory underlying the measurement by testing of the hypothesised relationship (LoBiondo-Wood & Haber, 2010). According to De Vos et al. (2011), construct validity is concerned with the meaning of the instrument, that is, what it is measuring and how and why it operates the way it does. Construct reliability was ensured by extensive literature review and the use of experts in the field of study. Furthermore, involves not only validation of the instrument itself, but also of the theory underlying it.

3.18 Pilot study

Creswell (2014) defines pilot study as a mini study that is conducted to test the reliability of the data collection instrument. The pilot study was conducted by including experts in the field of study who were knowledgeable regarding quantitative data collection tools construction. Furthermore, pilot study was also conducted to test for face and content validity of the questionnaire. Respondents were recruited to participate in a pilot study. They were also informed that participation was voluntary and the write to withdraw was indicated, and also that no punishment was in place for that.

The questionnaires were self-handed to the respondents after the permission was sought. The researcher remained in the field for any clarity that the respondents needed. Pilot study was done on 10 respondents, however, it was done in a different setting. The respondents who participated in the study didn’t form part of the main study. The questionnaire was refined according to the results and comments from the respondents as follows: in Section B, was about neonatal mortality and it was refined as factors influencing the quality of neonatal care for the sick neonates as a main heading. Then section C, section D and section E were renumbered as section B1,section B2 and section B3.

3.19 Quantitative data analysis

According to Creswell (2014) quantitative data was used for description, comparing groups and relating variables. Polit and Beck (2012) indicate that the descriptive statistics are used to describe and synthesis data. Descriptive statistics was used in the form of graphical and numerical manner to present and analyse the collected data. Frequency distribution tables and percentages were used to identify the responses of respondents from different hospitals. (Creswell, 2014a). The Statistical Package for Social Sciences (SPSS) version 25 software was used to obtain the means and standard deviations analyse and describe data from the questionnaires. Quantitative data analysis was used supported by qualitative data to gain a broader understanding of the outcome of the care (Babbie & Mouton, 2011).Inferential statistics refers to a group of statistics that is concerned with the characteristics of populations and that uses sample data to make an inference about the population. This permits the researcher to infer that particular characteristics in a sample exist in the larger population (Babbie & Mouton, 2011). In this study, a non-probability sampling technique was used.

3.20 Methodological overview of the model development and validation

Table 3.3: Methodological overview of the model development and validation

SEQUENTIAL EXPLORATORY MIXED - METHODS				
OBJECTIVES OF THE STUDY	DATA COLLECTION	POPULATION and SAMPLING	RIGOR	DATA ANALYSIS and REASONING STRATEGIES
Phase 1: Concept Identification				
Qualitative phase Explore the challenges faced by midwives regarding the neonatal care they provide to sick neonates in NICUs of public hospitals, Limpopo Province.	One-to-one semi-structured interviews (Interview guide)	Midwives (N=58) Non-probability criterion purposive sampling Sample size: 12	Measures to ensure Trustworthiness Credibility, Member check, Dependability, Transferability, Confirmability	Tesch's approach: Open coding process Categories and sub-categories
Quantitative Phase Assess the factors influencing the quality of care for the sick neonates in NICUs of public hospitals, Limpopo Province.	Questionnaires for midwives	Midwives (N=82) Simple random sampling Sample size: 68	Reliability Content validity Face validity Construct validity	Descriptive and inferential statistical analysis

Phase 2: Concept Analysis, Definition and Statement Formulation				
Develop a model for midwives who care for the sick neonates in NICUs of public hospitals, Limpopo Province.	Qualitative and Quantitative phase 1 results. Chinn and Kramer model development concepts		Measures to ensure Trustworthiness: Credibility, Member check, Dependability, Transferability, Confirmability Reliability Content validity Face validity Construct validity	Inductive Concept analysis, Concept synthesis Derivation Deductive Concept analysis, Concept synthesis Derivation Inductive Concept analysis, Concept synthesis Derivation
Construct relational statements between concepts in a model for midwives who care for the sick neonates in NICUs of public hospitals, Limpopo Province.	Qualitative phase and quantitative phase results	Concepts derived from concept analysis, related statements formed		Statement and theory synthesis (Walker and Avant, 2011)
Critical reflections of the model	Description of the process of the model	Description of the structure of the model		Synthesis
To validate the model by maternal health care experts for midwives who care for sick neonates in NICUs of public hospitals, Limpopo Province.	Feedback data from model validators	Formulation of guidelines based on the findings	Recommendations aligned with the model developed	Deductive Inductive reasoning Derivation

Table 3.3 shows the methodological perspectives of data collected, analysed to meet the objective of phase 1 which was concept identification for model development. The data that was collected and analysed in qualitative phase and quantitative phase of this study were used to meet the objective of phase 2 which was concept analysis, definition and formulation of relational statements for development of a model for midwives who care for sick neonates in neonatal intensive care unit of public hospitals, Limpopo Province.

Practice-Oriented Theory is a goal-directed and order of the required actions that are essential to yield the needed outcomes (Dickoff, James & Wiedenbach, 1968). Dickoff et al. (1968) maintain that if a Practice-Oriented Theory is developed centered on empirical evidence, it guides practice.

3.21 Concept identification, classification and description

Table 3.4: Concept identification, classification and description

CATEGORIES	DESCRIPTION
Context	The setting in which the activity takes place (midwifery).
Agent	The person that executes a particular activity (midwives).
Recipient	The person who receives the activity (sick neonates).
Procedure	The process to be followed to achieve the goal (midwives, neonatal guidelines and professional regulations).
Dynamic	The ingredient to drive the activity towards goal achievement (training & development of midwives, availability of human & material resources).
Terminus	The outcome to be achieved through implementation of the activity (provision of quality neonatal care).

Table 3.4 shows the list of classified concepts according to this study. Concept identification followed by concept classification and concept description, correspond with the first level of theory. The level one theory, factor isolation theory's function requires concepts to be classified and categorised. The list is made up of the context, agent, recipient , procedure, dynamics and terminus.

3.22 Ethical considerations

The proposed study was approved and cleared by the intra-departmental Review Committee on the 23 April 2018. Ethical clearance was obtained from the Turfloop

Research and Ethics Committee (project number: TREC/80/2019: PG), (Appendix III). Permission to conduct the study was obtained from the Limpopo Province Department of Health Ethics Committee on 2 May 2019 (Appendix IV). Permission to collect data from public hospitals was granted by the Hospital A (Appendix V and IX) and G (Appendix VI) management on the on the 29 May 2019 and 1 October 2019 respectively. The interview guide and consent form were devised in English. Scientific adherence to ethical principles was ensured by avoiding plagiarism, correct citing and acknowledgement of sources of information used, that is: statistician assistance, reviews done by the supervisor in quantitative processes. In qualitative processes, scientific adherence to ethical principles was ensured by, member checks, independent coding and also the reviews done by the supervisor. The study was language edited to ensure it is readable (Appendix XVII). Turnitin was done to minimise plagiarism.

3.22.1 Informed consent

A respondent voluntarily agrees to participate in a research study in which he or she has full understanding of the study before the study begins. The researcher ensured informed consent was obtained by explaining to the respondents what was to be investigated, the expected duration of the respondent's involvement, the procedures that were to be followed during the investigation, the possible advantages, disadvantages and dangers to which respondents may be exposed (De Vos et al., 2011).

The respondents were informed that they have the liberty to withdraw from the study at any time without being harmed (De Vos et al., 2011). The consent form was signed by the participants who were interviewed and the individuals who responded to the questionnaire as evidence of granting the researcher permission. Verbal informed consent from all participants to audiotape their interviews were obtained. The researcher ensured that the signed consent forms are treated with utmost discretion and stored away in a correct manner so that a particular form can easily be found if the need arises. The data collection methods were explained to the respondents, namely, questionnaires, interviews, audiotape recorder and field notes (Botma et al., 2010).

3.22.2 Autonomy

Autonomy emphasises the right of an individual to make decisions for him/herself (Verklan & Walden, 2010). Autonomy was ensured by explaining to respondents that they have the right to decide whether or not to participate in the study without prejudicial treatment (Botma et al., 2010). The respondents were informed that they have the right to withdraw from the study at any time, to refuse to give information or to ask for clarity about the purpose of the study. The researcher didn't force the respondents to participate in the study, given that respondents are to participate voluntarily (Babbie & Mouton, 2011).

3.22.3 Confidentiality

LoBiondo-Wood and Haber (2010) defined confidentiality as the researcher's responsibility to prevent all data gathered during the study from being divulged or made available to any other person. The researcher assured the respondents that the information about the respondents would not be made available to anyone who was not involved with the study, by keeping the completed consent forms in a locked cupboard together with completed questionnaires, field notes, transcripts and audiotape recorder.

The field notes and transcripts were kept in password secured computers and audiotapes were stored in locked cupboards. The respondents were informed that they have the right to withdraw from the research investigation at any point. In addition, they also had the right to refuse to answer any question asked and to have the confidentiality of their data protected (LoBiondo-Wood & Haber, 2010).

3.22.4 Anonymity

Anonymity means that no one, including the researcher, should be able to identify any respondents afterwards (De Vos et al., 2011). Anonymity was ensured in both qualitative and quantitative data collections by keeping the respondents' identity unknown, even to the investigator. The respondents were informed not to write their names on the questionnaires and consent forms. Furthermore, they were given names to identify themselves with during interview sessions and were assured that real names would not appear on the research report to avoid revealing any identity. Codes were used instead of institution names to assists in the detection of patterns; no personal information was used in the transcribed texts. The interview transcripts and the questionnaires were identified by codes. The audio recordings will be kept for three years after data analysis and then deleted (Botma et al., 2010).

3.22.5 Privacy

According to De Vos et al. (2011), privacy is to keep to oneself that which is normally not intended for others to observe or analyse. Privacy was ensured by having session in a private place where there was only the researcher and the participants, to avoid disturbances. The audio recordings during data collection were made available only to the supervisor and the independent coder to ensure privacy (LoBiondo-Wood & Haber, 2010).

3.22.6 Protection from harm

According to Botma et al. (2010), every person has the right to be protected from any harm and discomfort. The participants were protected from physical and emotional harm and discomfort. Moreover, the researcher took into consideration that some participants might become emotional. Covid-19 protocols were adhered to minimise harm. Counselling was arranged beforehand in case of psychological or emotional harm, however, no participant required referral. The participants were informed beforehand about the potential impact of the investigation. In addition, the participants were not forced to share the information that they chose to withhold, such as emotions triggering questions.

3.24 Bias

Bias is any influence that produces a distortion or misrepresentation of an outcome of a particular finding of a study (De Vos et al., 2011). The researcher avoided asking respondents leading questions. The participation was determined randomly using random number generation before the study begun to ensure that there is no systemic bias in either group. The researcher avoided too small or too large a sample to get accurate answers. Simple random sampling was used to ensure that all the respondents get an equal chance of participating in the study, in order to minimise selection bias. Furthermore, it was ensured that the respondents understand all questions and clarified questions that were not clear to the respondents. In addition, the researcher bracketed what was already know about the topic during interview sessions (Burns & Grove, 2011).

3.25 Integration and interpretation of the results

The study employed a sequential exploratory mixed-method design consisting of first gathering qualitative data to explore the phenomenon, and then collecting quantitative data to test relationships found in the qualitative data. Furthermore, the integration of qualitative and quantitative data was done to provide a more complete understanding of the results than either approach alone. Integration of the results was done through collation to merge the qualitative and quantitative results to establish the similitude and contrast and expansion. Furthermore, qualitative and quantitative data then become interdependent in addressing common research questions. One key integration technique is joint displays that involve the development of a figure, table or graph to juxtapose quantitative and qualitative data or findings (Creswell, 2014).

3.26 Summary

This chapter described the mixed - method research approach and design in details. The study site, population, inclusion and exclusion criteria and also the sampling methods were described. The sample size in qualitative phase was determined by data saturation while in quantitative phase sample size was calculated using Slovin's formula. Ethical principles were observed throughout as the participants' names remained anonymous. In the qualitative phase, data was collected using one-to-one semi-structured interviews which lasted for approximately 30-35 minutes. Quantitative data collection was done through administration of questionnaires to the participants after signing the informed consent form. The participants completed the questionnaires in the presence of the researcher. Qualitative data was done using the eight steps of Tesch and SPSS version 25 for quantitative data. Data was analysed individually staring with the qualitative data and after quantitative data was analysed. Furthermore, integration of both findings was described. Chapter four presents results of both qualitative and quantitative methods.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF THE FINDINGS

4.1 INTRODUCTION

The preceding chapter discusses the mixed - method approach and the exploratory sequential mixed - method design. This chapter layout the presentation and interpretation of the qualitative and quantitative findings where midwives were interviewed and also completed the questionnaires to fulfil the study objectives. In analysing the data, key issues in the midwives challenges, were identified, and themes and sub-themes developed. The interviews took place in the NICUs where the sick neonates were admitted for neonatal health care services. The results are presented according to the themes and sub-themes that were identified. The findings are presented in a consistent flow of the exploratory mixed - method design, that is, it will commence with the qualitative phase and quantitative phase will follow.

4.2 Objective of the qualitative phase

The objective of the qualitative phase was to:

- Explore the challenges faced by midwives regarding the neonatal care they provide to sick neonates in NICUs of public hospitals, Limpopo Province.

4.3 Qualitative data analysis

Data analysis in qualitative research is a process where the researcher is immersed in the data with the purpose of finding the meaning and interpretation of the study participants' experiences to form an evidence-based understanding of the research topic (Hennink et al., 2011).

4.3.1 Demographic data of the participants

Table 4.1 present the demographic variable of the midwives who were sampled for qualitative phase.

Table 4.1: Demographic variables of the midwives

N=58, n=12			
Variables		Hospital G, s=6	Hospital A, s=6
		ℱ(%)	ℱ(%)
Gender	Female	5 (41.7)	6(50)
	Male	1 (8.3)	0 (0)
Age	30-36	1(8.3)	2 (16.7)
	36-40	1(8.3)	1 (8.3)
	41-45	4 (33.3)	3 (25)
Duration of experience in NICU	> 5 years	4 (33.3)	4 (33.3)
	< 5 years	2 (16.7)	2 (16.7)
NICU speciality	Trained	2 (16.7)	0 (0)
	Not trained	4 (33.3)	6 (50)

Table 4.1 presents the demographic data of the participants, including gender, age, duration of experience in the NICU, and NICU specialty. The study population comprised midwives from one regional hospital and one tertiary hospital in the Limpopo Province, with a sample size of 12. Almost all participants were female, with only one male, highlighting that nursing and midwifery remain female-dominated professions. None of the participants from the regional hospital had a specialty in neonatal care, while only two participants from the tertiary hospital held a specialty qualification. Most participants were aged between 41-45 years, followed by those aged 30-35 years, and then 36-40 years. Most had over five years of experience in the NICU, with only two participants having between six months and one year of experience. This indicates limited opportunities for growth and learning within the NICU.

- *Data analysis process*

The researcher listened to the audio recorder repeatedly to get a sense of the whole information and transcribed it verbatim. The field notes and transcripts were read also to get senses the data. Thereafter, the researcher picked the most interesting interview and went through it, asking herself, what it is about. When this task is completed for several participants, a list of all topics was made. Similar topics were clustered together.

Descriptive wording of topics was turned into categories. All data within the same theme were then grouped into sub-themes as needed. Seven themes emerged from the findings of the collected data, namely, shortage of staff in NICU, insufficient material resources, inadequate equipment for provision of neonatal care, inadequate infrastructure, failure to comply with infection control principles and lack of neonatal ICU specialty. Table 4.2 indicates the data that emerged from midwives verbatim transcripts in the form of themes and sub-themes. Data analysis in this study involved making sense of both the midwives' perspectives to develop a suitable model to promote neonatal care in the NICUs.

4.3.2 Results of semi-structured interviews

The data gathered from the midwives' interviews were analysed using Tesch's eight (8) steps for organising semi-structured qualitative data in qualitative research. The analysis was done manually rather than using a software. The process of determining themes is by identifying three to six key issues from the abstract ideas that summarise the entity being researched (Grove et al., 2013). To identify the themes and sub-themes, quotations from the transcribed data were used. These quotations increased the transparency of the analysis and its interpretation. Themes and subthemes were categorised from midwives' interviews, which were to explore the challenges faced by midwives regarding the neonatal care they provide to sick neonates in NICUs of public hospitals, Limpopo Province as shown in Table 4.2.

4.3.2 *Themes and sub-themes*

Data were inductively analysed and three (3) themes emerged from the data analysis namely: (1) challenges on provision of neonatal care, (2) Neonatal ICU midwives challenges, and (3) Suggested solutions to improve quality neonatal care. Table 4.2 present themes and sun-themes that were identified during the process of data analysis.

Table 4.2: Themes and sub-themes related to challenges on provision of neonatal care to sick neonates and midwives coping strategies

Themes	Sub-themes
4.1 Challenges on provision of neonatal care	4.1.1 Infection prevention and control in NICU. 4. 1.2 Close monitoring of neonates' baseline data through CPAP and ventilator. 4.1.3 Monitoring of neonates' feeds, fluid and electrolytes balance. 4.1.4 Provision of emergency neonatal nursing care. 4.1.5 Conduct doctors' rounds and carrying of orders. 4.1.6 Giving mother's advice on how to feed the neonate. 4.1.7 Continuity of neonatal care through report taking and giving.
4.2 Neonatal ICU midwives' challenges	4.2.1 Shortage of midwives. 4.2.2 Shortage of neonatal equipment and material resources in neonatal ICU (negative and positive feelings). 4.2.3 Inadequate neonatal unit infrastructure. 4.2.4 Increase rate of nosocomial infection and neonatal mortality, blame on infrastructure and referral neonates. 4.2.5 Increased workload due to admitting more than the unit bed capacity. 4.2.6 Inadequate quality neonatal care due to lack of job training in NICU.
4.3. Suggested solutions to improve quality neonatal care	4.3.1 Training on neonatal intensive care speciality and on the job training. 4.3.2 Continuous monitoring of the neonatal units by the provincial Department of health. 4.3.3 Adequate material and human resources in NICU 4.3.4 Adherence to neonatal protocols.

4.4 Theme 1: Challenges on Provision of neonatal interventions by midwives

Provision of neonatal care was described in-depth by the midwives who participated in the study. Provision of neonatal is a critical factor for survival or sick and small neonates. Participants reported how they have cared for sick neonates admitted in the units which involves infection prevention through applying aseptic techniques. Caring for neonates needs a team intervention where doctors will see the neonates and midwives carry their orders, there is a need for continuity of care as such recording and report writing and giving is essential. Participants reported the need to be vigilant as the neonate can change the condition within a blink of an eye. Participants indicated care in administration of medicines to sick neonate and involvement of the mother as they are always around, and they can assist in reporting any change in the neonate's condition.

From this theme, seven (7) sub-themes emerged as indicated in Table 4.1 above. The sub-themes were indicated below.

4.4.2 Close monitoring of neonates' baseline data through CPAP and ventilator

It is a challenge for midwives to provide care for small and sick neonates as they do not always respond the same way to the same treatment. Participants described the care they provided to the small and sick neonates on life support machines such as CPAP and mechanical ventilators. Participants maintained that they monitor small and sick neonates on life support machines very closely because neonates cannot communicate verbally to say I am feeling this and that.

This was supported by the following quotes from participants:

P1: *"So sisters who are working there must always be there because the baby can crash at any time so when help is needed you must always be there".*

P2: *"Babies here they are under machines, we are just monitoring. If the baby change condition, we act accordingly with our doctors. In most cases nurses who are allocated in neonatal ICU they don't have movements, movements I mean going out to buy, going to see friends, we are there because we are dealing with small babies who cannot answer for themselves, who cannot tell you that I am suffocating, we must be there observing".*

Providing optimal ventilation strategies remains the key to success of managing small and sick neonates. Midwives caring for neonates receiving mechanical ventilation face several challenges. Observing the monitor, ventilation devices, oxygen delivery systems, and patient's oxygenation along with the neonates himself are important components of neonatal care. Therefore, expertise and extreme care are important aspects in providing safe and effective neonatal care.

In NICU, vital signs that are continuously monitored in sick neonates include the body respiratory rate, heart rate, oxygen saturation and body temperature. Midwives indicated that they monitor vital signs three (3) hourly, however, vital signs monitoring should be done hourly in critically ill neonates. None of the participants indicated one-hour vital signs monitoring irrespective of how critical the sick neonate's condition would be. This was supported by the following quotes from participants:

P12: *"We do temperature, respiration, heart rate, HGT and then saturation. We use the monitors to monitor them. Three (3) hourly: 09h00, 12h00,15h00 and 18h00 and continue night from 21h00, 00h00, 03h00 and 06h00 in the morning".*

P3: *"Then when the baby arrives then we do the vital signs, HGT first, then we monitor the baby we want to see the saturation of the baby even the heart rate".*

P4: *"We are doing our vital signs 3 hourly, we are taking blood glucose which will determine the baby is feeding alright or the baby is okay and all other vital signs are written in the machine we just write what is there. Glucose we take, we check every baby, if the sugar is not normal…".*

4.4.1 Infection prevention and control in NICU

The Guidelines for Environmental Infection Control in Health-Care Facilities (2019) concludes that the recommendations of the Centre for Disease Control and the Healthcare Infection Control Practices Advisory Committee indicates that some infections were associated with infrastructural building and maintaining these health care facilities buildings could reduce compromising infection control standard precautions. Transmission of infections in neonatal intensive care is mainly through non-adherence to hand hygiene protocols, thus resulting in increased mortality. The midwives in the NICUs indicated that they always adhere to infection prevention and control strategies such as hand washing, cleaning of sick babies' beds and changing of linen is their daily routine. Despite the workload and the overcrowding of neonates faced by the midwives they still continue to adhere to infection control protocols.
Furthermore, one participant maintained that they also train the mothers in infection control and prevention, more especially hand washing before handling their babies. The following quotes support adherence to hand hygiene protocols:

P4: *"Then we even train these women when they come, they must close the door, wash their hands for personal hygiene."*

P1: *"First thing in the morning when we enter the unit you do wash your hands, after that we clean the incubators, we change the linen."*
P2: *"We sanitise our hands before handling and after handling we sanitise and go to the next baby."*

P3: *"We make sure that those beds are washed, we are doing daily washing and changing of linen so that our babies are nursed in a clean environment."*

Important environmental sources of infections for the neonate include the hands of the individuals who care for the many needs of the baby, including healthcare workers. This implies that midwives should adhere to hand washing practices to curb the spread of cross infections between the neonates. It is impossible to comply to hand washing practices without all supplies available. The management needs to ensure that hand washing facilities are in a good working order and supplies are always available.

4.4.3 Monitoring of neonates' feeds, fluid and electrolytes balance

Participants indicated that they monitor sick neonates' feeds, blood glucose, fluid and electrolyte, and also monitor the neonates closely for incidences such as vomiting to prevent aspiration. Furthermore, they also comply with the doctors, when the doctor prescribed nothing to be given by mouth. The statements were supported by the following quotes:
P1: *"You find that at 6am they feed their babies, sometimes you find the baby has just slept have vomited that food and they are out, we check even when the abdomen is not distended. "*
P4*: "Babies who are not fed ordered by the doctor maybe for that moment. We must keep them on nil per os, nothing to be given orally except for the maintenance of the IV line. "*

P5*: "Sometimes you find that the sugar low, blood glucose in neonatal ICU determine how is the baby feeding alright, is this baby getting enough fluids, such things."*

Management of neonatal fluid and electrolyte therapy is challenging as these factors and the clinical setting need to be accounted for while caring for neonates, especially small or preterm neonates.

4.4.4 Provision of emergency neonatal nursing care

Participants indicated that sometimes they had to provide emergency neonatal care such as resuscitating the neonates which includes administration of dextrose in case the neonate's blood glucose is low pending the availability of the doctor. When the doctors come, he/she will find that the neonate is stabilised.

> ***P4:*** *"If blood glucose is low, we put up a drip, then we regulate it then we notify the doctor telephonically. When he arrives, he found that we have done the main nursing measures so as to help the neonate to live."*

> **P2: "***Ventilate according to the doctor's orders and at the same time we ventilate before the doctor arrives".*

> ***P1:*** *"Sometimes while you are busy resuscitating that one another aspirate then you must… those who are in N2 (nursery 2) they must rash the baby to ICU because always there must be 4 sisters there then they must run. "*

Resuscitation as an emergency was indicated by the participants, and that they are able to assist the neonate by administration of fluids and medication through a drip, pending the availability of the doctor, in case the blood glucose is low. According to Linakis, Roberts, Lala, Spigarelli, Medlicott et al. (2016), intravenous medication administration is the preferred route of administration in critically ill neonates. Midwives needs to be extra careful to avoid administering too much fluid to neonates at once as blood volumes range from approximately 250 millilitres (mls) for a standard term neonate to less than 60 mls for a 600 gram preterm neonate, and less for even smaller neonates who are surviving today.

4.4.5 Conduction of doctors' rounds and carrying of orders

Taking of doctors' rounds are of paramount importance to plan, implement and evaluate the care received by the sick and small neonates. Participants reported that they do the rounds together with the doctors and thereafter carry out the doctors' orders. The ward rounds in the NICUs are done on daily basis by the midwives and doctors, however, midwives indicated that doctors remain in the unit for the whole day. The following quotes support this:

P1: *"Then after that the doctors came to the ward rounds, we note the orders ordered by the doctor, then we implement what we are supposed to do".*

P12: *"Ventilate according to the doctor's orders and at the same time we ventilate before the doctor arrives".*

P9: *"After that it will be followed by the doctors for their normal routine to come and do the ward rounds".*

P5: *"Doctors will come and take the rounds; doctors take rounds every day. They can be here for the whole day, sometimes we are busy in such a way that they don't even go for tea or lunch, so they are here with us. They take rounds, we take the instructions from them".*

Doctors or ward rounds are of paramount importance for planning, implementing and also evaluating neonatal care. Patients are discussed in depth during the ward rounds which may also help with gaining of knowledge of management of neonatal condition. Furthermore, midwives could have a chance to ask for clarity while from the doctors regarding the orders that they have to carry. Therefore, doctors' round should always be values for gaining more knowledge and improve the care provided to the sick and small neonates.

4.4.6 Giving mother’s advice on how to feed the neonate

Participants indicated that they give mothers health education on infection control and mostly the hand washing before touching their babies. In addition, midwives explain to the mothers the care that they provide to their babies. The following quotes support the above statement:

***P4:**” Nursing babies in neonatal ICU is difficult because we are dealing with babies, we are dealing with their mothers. Their mothers don’t understand most of the machines, sometimes if they find you doing this, they want to know and is their right. What are you doing to my baby? So, you must always explain, now your baby has changed condition, now we are doing this and that”.*

***P5**: “We give them in-service training every morning on how they must care for their babies and how we must assist each other. I am nursing the baby she must assist me in doing this and that, so we must have a friendly relationship, we must be friends”.*

The findings revealed that midwives in NICUs were not dealing with the neonates only but also their mothers. This implies that midwives involve mothers in the care of their babies, and they also make sure that they are up to date with the progress of their babies. Therefore, family-centred care is partially provided and fathers of the neonates and other visitors were not mentioned.

4.4.7 Continuity of neonatal care through report taking and giving

Report taking and giving is one of the responsibilities of midwives. Participants indicated that they take report and also give report to the midwives on night duty for continuity of care.

***P11:** “First thing in the morning when we enter the unit you do wash your hands and dry it then we took report from the night staff”.*

***P3:** “When we come into the ward, we take report from the night staff after that every morning”.*

P5: *"Then we write a report which was given by the night staff: how did the baby sleep? What happened? Did the baby crash? What happened? Which steps did they take? then we take it from there. Then after writing a report, hand over report we go forward, then we write after that we wait for the doctors".*

The findings revealed that midwives understood the importance of report giving and report taking for continuity care. Provision of neonatal care is for continuous for 24 hours, however, there is no midwife who work for 24 hours. Some midwives are allocated on day shift whereas other are on night shift, however reporting between the shift is critical for effective and continued care.

4.5 Theme 2: Neonatal ICU midwives challenges

The participants maintained that they experience numerous challenges when providing neonatal care to sick neonates in NICU. Six (6) sub-themes emerged from this theme and are discussed below.

4.5.1 Shortage of NICU midwives

The midwives in the NICU at the selected public hospitals identified their major challenges as the lack of adequate numbers of midwives to care for the number of sick neonates in the unit. Midwife-to-neonate ratios appear to affect outcomes of neonatal intensive care, but limitations of the existing literature prevent clear conclusions about optimal staffing strategies. Midwives continuously mentioned the shortage of midwives in their respective units, and that the correct staff to patient ratios are essential for quality neonatal care, but that this is not possible due to the substantial neonate demand.

P2: *"We are short staffed you see that you can't just uh…uh. According to intensive care unit one-is-one (1:1) more especially nursing the ventilated babies you can't nurse two (2), but it happens sometimes, you nurse a ventilated… like today I was nursing a ventilated baby with the other one who is on DuoPAP or sometimes maybe on nasal prongs".*

P10: *stated that: "And the shortage of staff, like now in the afternoon there will be two (2) nurses only because here is eight (8) bedded room. Those two (2) nurses must make sure that they work this unit, these two (2) units: N1 (nursery 1) and N2 (nursery 2) and* *also Kangaroo Mother Care (KMC), so shortage of staff is a problem, a very big one, a very big one.*

***P12**: "The challenge uh…uh… one big challenge that I can mentions is just shortage of staff. At neonatal ICU, one sister must nurse one baby, so we don't have enough staff to do that. You find that sometimes we are just four (4) and babies are eight (8) sometimes they are ten (10), you find that one sister is nursing three (3) babies others two (2).*

***P4:** "On the staff, we do have shortage of staff really shame cause on daily basis we are four (4) registered nurses from Wednesday to Wednesday even the other group they are four(4), so far it is not enough. Four per eight (8) beds more especially in ICU is not, it should be 1:1 unlike we used to work outside Limpopo, 1:1 normally".*

According to participant ten (10) midwives who were allocated in NICU were overworked because they had to also assist in the nursery, the high care and also in the KMC units, more especially in the afternoon when other midwives and nurses allocated in those units go off duty. This implies that midwives experience extra increased workload and there is also increased risk of infection spread, because the midwife attends to several neonates outside the NICU and go back to continue with provision of care in the NICU afterwards.

4. 5.2 Shortage of equipment and material resources in neonatal ICU

Midwives had different feelings regarding the shortage of equipment and material resources. Some felt that the equipment and material resources were adequate whereas others felt that there was shortage and some of the available once were non-functional.

The following quotes were indicated by the midwives:

***P10:** "A shortage of equipment, sometimes some of the equipment are malfunctioning, not working properly like sometimes you find that we want to put the baby in an incubator, you find that, that incubator is not warm and also the linen is not enough for us. Sometimes even the hand towels for drying our hands, but the soap is always available".*

***P12**: "The servos are not working; we use the head servos which means that we are supposed to be having the servos. All the servos I think is only three out of eight which are working, is only three currently are working the rest are not working. And even the monitors, sometimes we are not having enough, we have to borrow from one baby to another".*

***P4**: "Eish! The equipment at the moment… in ICU each baby must have own monitor because the ICU each and every baby must have a monitor, so if you find that maybe we are three or four and if is four that means we are going to monitor four babies correctly the other ones must move during the vitals, it won't be continuous but if we are having eight monitors that means it will be continuous because as ICU each one must have own monitor, so now at the moment we are having four".*

Positive feelings regarding equipment and material resources:

Some participants felt that the hospitals were doing enough with purchasing of equipment and they also ensured that when the equipment was broken the mechanics were called to fix them and they were also maintained.

P4: *"Normally in neonatal that side we don't improvise a lot we have what we need to use*".

P12: "*Sometimes we experience our equipment some are broken not working but they try their level best to check every now and then maybe to call those who have brought the machines to come and fix it and to come service it".*

***P9:** "Like for instance, now we are not having a refrigerator for the medication. It has been a long time requesting they said they don't have money to buy the refrigerator".*

The findings revealed that participants were faced with challenges of limited bed space and the lack of equipment and material resources, however they strived to complete the given tasks to save the lives of the sick neonates. Some participants indicated the lack of equipment such as a medicine fridge, inadequate linen supply and lack of hand towels were noted, however, the hand washing soap was always available. Equipment such as incubators, monitors, ambu bags and neo-puffs oxygen and suction apparatus, should be available and always in good working order for midwives to execute quality neonatal care to small and sick neonates. Neonates had to share monitors whereas continuous monitoring and high-quality care were expected. Without the required and functional equipment, quality neonatal care is compromised. Furthermore, the baby could change condition while the monitor is still used on another neonate and that could not be easily picked up. Therefore, there is a need for purchase of adequate equipment and material resources for provision of quality neonatal care.

4. 5.3 Inadequate neonatal unit infrastructure

Most of the participants maintained that the infrastructure is inadequate due to the number of babies admitted and transferred from peripheral hospitals. Moreover, it was indicated that sometimes they admit more that the unit capacity and during the era of Covid-19 it was worse because 1.5 m distance was required, and it was not possible due to the limited space.

***P1:** "The space is small as well, So and when they are many the staff is very small, the movements are limited because the thing of 11 or 10 instead of 8 there must be a monitor, there must be suction so that when the mothers are coming to feed their babies the space is very small. Like now during this period of corona the distance is not 1.5 m there will be a spread of infection".*

However, some participants had different views with regards to the infrastructure in NICU. They indicated that the layout and the space is enough for ICU, the problem was admission beyond bed capacity.

***P12:** "The space is small…the space is small. You can see one bed is having machines, is having DuoPAP, it need stand, monitor in one bed, every bed must have those things. And the space you find that you cannot work properly, so the space is small".*

***P7:** "The space is not enough. Our unit is too small, like this time of Covid because they say we should not be many. We are always many, its nurses, doctors, dieticians. Our unit doesn't have linen room. We don't have line room here, we don't have sluice room in our unit, and we are using the other unit".*

P8: *"Our infrastructure in ICU the space is okay, I can say. The only challenge is in our high care, the space is not enough. ICU is 8-bedded, you find that there is a baby who needs to be ventilated. We put babies there while there are more than 8 and N1 (nursery) does not have medical air. We nurse sick babies in the high care, sometimes they are forced to be nursed in ICU because of space. We are okay with the space; the problem is we get more babies. The 8-bedded for an ICU is okay, but the number of babies we receive… they are many.*

The findings revealed that midwives were not satisfied with inadequate space in NICU which was further reduced by the number of machine used and also by multidisciplinary team members who also came to review the neonates. This results in congestion of the healthcare practitioners in the unit which ultimately put the neonates at the risk of infections. There is a need for the management to renovate the NICUs in order to accommodate the equipment used in there and also the healthcare provides who are attending to the neonates.

4. 5.4 Increase rate of nosocomial infection and neonatal mortality blame on infrastructure and referral neonates.

Midwives showed their dissatisfaction with the increased rates of nosocomial infections and neonatal mortality which they believed were caused by inadequate infrastructure and delayed referral of neonates. Participants indicated that most of the deaths occurred because of inadequate space in ICU. When the unit is full, beds will be added in order to admit other sick neonates and by so doing the space was reduced more. When the space is limited, neonates are many and midwives are inadequate there are more chances of cross infections which results into mortality. Other participant maintained that extreme low birth weight babies and referral babies had a very huge impact on increase in mortality. These are expressed in the statements below:

P3: *"I have noticed there is an increased rate of infection, nosocomial infections. And the other thing is, we admit patients from other hospitals so most of them when they come the condition is very bad and the prognosis is very poor. So, when they count the death, they don't say they are from other hospitals, they say from this hospital. And also, the extreme low birth weight they also… what can I say, increase the number of deaths".*

P7: *“I think one of our challenges is late referral. Sometimes babies are referred very late. Some of them are having multiple congenital abnormalities beyond our control. Those are some of the contributing factors to mortality”.*

P12*: “According to infection control, it must be 1.5 to 2 m apart but sometimes if we are having 10 it can’t be, there would be cross infection but if it is 8 bedded and it is 1.5 to 2 m it is okay”.*

This implies that nursing a small or sick neonate could have some psychological effects on the midwives. They can feel unexpected, powerless, fearful, worried, sad and other negative feelings. According to participant 4, sometimes midwives become emotional and to an extent of crying because of the high neonatal mortality rates in their units. Furthermore, this shows that midwives face emotional pain caused by the death of neonates. The quotation below indicates this:

P11*: “Some other months Ijhoo… we even cry…you find that day staff lost a baby a night nurse lost a baby, it is demoralising”.*

P7*:* Our working situation uh…I cannot say is not good but is not fair to us even to our neonates.

The findings revealed that revealed that midwives were not satisfied with the situations they had to face on daily basis which drains them emotionally. The midwives needs to be empowered psychologically in order to be able to cope with various situation in order that they may be able to provide the quality neonatal care. Furthermore, it is not easy to provide the required care while the provide is not in psychologically or emotionally well. Therefore, there is a great need for a continuous professional counselling of the midwives more especially after losing the neonates in the form of death.

4. 5.5 Workload due to admitting more than the unit bed capacity

Participants reported increased workload due to the increased number of admissions beyond the unit bed capacity. They had to add extra beds to accommodate the new admissions who require intensive care services. This is indicated in the following excerpts:

P12: *"The challenges we have, sometimes you see in neonatal intensive care unit you must nurse eight (8) babies, sometimes it happens that there are more than eight babies".*

P9: *"We accommodate only eight in that area. Sometimes we put another extra two beds to make it 10".*

P4*: "Due to overflow of patients… sometimes you find that we are nursing eight (8) babies neeh, sometimes you find that they are ten (10) or they are twelve (12)".*

P6: *"We admit more than eight babies sometimes. We have extra oxygen points, if there is a push, we admit three, you find that the total is eleven (11). Sometimes we admit 11 sometimes we admit 10 because this is a referral hospital. If there is a push, we admit"*

4. 5.6 Inadequate quality neonatal care due to lack of training in NICU

Midwives who are providing neonatal care to small and sick neonates in NICUs should undergo neonatal intensive care training. The majority of the midwives who participated in this study were not trained as neonatal intensive care nurses. Participants complained of lack of neonatal intensive care specialities although they are working in NICU caring for critical patients. Other participants stated that they were only trained for LINC, however they still needed a speciality because they are working in ICU or on LINC which is the short course for all midwives working in neonatal units. The following quotations support this perception:

P11: *"Eh, if it was… you see us we are just trained for small neonates after delivery and the caring of that baby, there is no who is specialised with neonates. There should be two (2) with speciality so that we can nurse with them and then they have more knowledge than us. We only did LINC we didn't do the speciality of neonates, only midwifery with LINC. It is important to have a well-trained speciality nurse with neonates. At the moment* *we don't have, but due to the experience we have, and the training of LINC is then that we could manage the babies".*

***P2**: "Okay, most problem here is that we are not neonatally trained. We do not have speciality to work in ICU".*

The findings revealed that the midwives were dissatisfied with lack of training in neonatal care because they viewed extra training as important for improved neonatal interventions and the reduction of mortality. Furthermore, it indicates that midwives believed they would provide better neonatal with more knowledge and skills from trainings. There is a need for the management not to hesitate granting the midwives working in NICU opportunities of professional development in neonatal care

4.6 Theme 3: Suggested solutions to improve quality neonatal care

The participants pointed out their suggested solutions to improve the quality of neonatal care. Four (4) sub-themes emerged from this theme.

4.6.1 Training on neonatal intensive care speciality and on the job training

Management of sick and small neonates require extra training on neonatal intensive care and neonatal care. Midwives indicated the need for training on neonatal intensive care speciality and on job training. One participant indicated that experienced and interested midwives who are allocated in other units should be given an opportunity to assist in NICU. The following quotes support:

> ***P12:** "Even if they don't train people for ICU but those that have experience and are interested to come and assist in neonatal, they need to be in-serviced, is just a matter of a day just to orientate people and we are on the way of living".*

> ***P9:** "If we can have enough equipment then maybe they hire 2 with the speciality of neonates and maybe they hire the speciality and yaah…"*

The findings revealed that majority of the were not trained in neonatal care speciality, however, they were expected to provide high quality care which was not easy without the training. Most of the midwives felt that speciality in neonatal intensive care is of paramount important for provision of quality neonatal care.

4.6.2 Continuous monitoring of the neonatal units by the provincial Department of Health

The participants expressed the need for unannounced visits by the Department of Health or peers in the hospital for observation and support. One participant felt that continuous monitoring by the Provincial Department of Health could assist them to work better because they would observe the conditions they are working under. Furthermore, it was indicated that their feedback could assist the midwives in providing quality neonatal care.

P3: *“Can I say the staff from the province to come regularly to check the service that is provided in each and every hospital, just to see if we are working within. Yes, because I think it will be much better and also if they can give us the report where we can improve so that we can do better next time”.*

P1: “*If we can have peer reviews, they just to come without telling us that they are come so that they can the true reflection of our situation, maybe their report to the management can bring changes”.*

The findings revealed that midwives hope that unannounced visits or monitoring can bring changes because monitors reports might cause the Department or management to act. This implies that midwives believed that announced visits could bring the wrong impression of the situation they work under. Announced visit may assist the unit manager to be ever ready and ensure adequate availability of what is needed for provision of neonatal care.

4.6.3 Adequate material and human resources in NICU

Participants suggested provision of adequate material and human resources that will be compatible with the demand to admit referrals and to provide care according to the intensive care unit ratio of at least 1:1.
P4: *“I think if they can add more area and add staff to prevent shortage”.*

P10: *"To uplift the care that we are doing is just to have enough staff because if I'm allocated one baby…".*

P9: *"Starting with resources, if we can get enough resources CPAP and the circuits to put babies on ventilators, clean and sterile. I think there will be much more improvement and also hiring more staff and taking our sisters for training, it will be much better".*

P5: *"I can say eight (8) bedded we need equipment, we must have enough equipment, such things".*

Midwives in this study felt that the provision of neonatal cares to sick and small neonates could improve with adequate material and human resource. Nurse-patient ratio of 1:1 in ICU could not practically apply due to a smaller number of midwives and a greater number of neonates. The need for hiring more staff and training the available staff and also adequate availability of material resources was emphasised by the participants.

4.6.4 Adherence to neonatal protocols

Participants felt that it is of paramount importance for them to adhere to the neonatal protocols, however it was not easy when neonates were many. The other participant concluded that even when the midwives nurse two sick neonates on the mechanical ventilator or CPAP, they should ensure that protocols must always be adhered to, however, when sick neonates are many, it is not easy or possible do follow the protocols.

P2: *"And then you must eh…make sure that those two (2) are nursed according to the protocols, but if babies are more you can't do that".*
P11: *" I think if the doctors can develop some protocols and also update the available once to suit the current guidelines that could also assist us to work smoothly".*

The findings revealed that the midwives were determined to adhere to protocols, however, in some situations they couldn't due to more number of neonates to attend to. Furthermore, it indicates that midwives need to practice according to the protocols that's why they call for updating and development of new protocols so that they could guide them in provision of neonatal care. Protocols could guide the midwives in management of certain conditions and in case of emergencies they would be able to act effectively pending the availability of the doctor.

4.7 Quantitative phase data analysis

4.7.1 Objectives of the quantitative phase

The objectives of the quantitative phase were to:

- Assess the factors influencing care for the sick neonates in NICUs of public hospitals, Limpopo Province?

The quantitative phase presents the results from the sixty-eight (68) midwives who were sampled through simple random sampling. The collected data was summarised in tables, figures and graphs. The presentation of the results from the midwives questionnaires consist of: Section B, B1: neonatal resuscitation, B2: main causes of neonatal mortality, B3: factors that lead to poor neonatal quality care and B4: neonatal interventions for sick neonates.

4.7.2 Section A of the questionnaire: Socio-demographic data

Socio-demographic data of respondents included age, gender, rank, educational program, period of experience in NICU and hospital working at presently.

- *Age of the respondent*

Table 4.3 indicates age of the respondents which was studied to ensure that various age groups were included in the study.

Table 4.3: Age of the respondents, n=68

Age	n = 68	%
21 – 25	0	0
26 – 30	27	39,7
31 – 35	4	5,9
36 - 40	24	35,3
41 – 45	11	16,2
46 – 50	2	2,9
51 and <	0	0

Most of the respondent were aged 26-30 (n=27, 39.7%) years, 36-40 (n=24, 35.3%) years, 41-45 (n=11, 16.2%) years, 31-35 (n=4, 5.9%) years and then 46-50 (n=2, 2.9%) years. None of age group 21-25 and 51 and above years respondents in the study. Majority of the midwives were young and middle aged as compared to the older ones.

- *Gender of the respondents*

Figure 4.1 shows the gender the respondents which was studied to ensure that both females and males were included in the study.

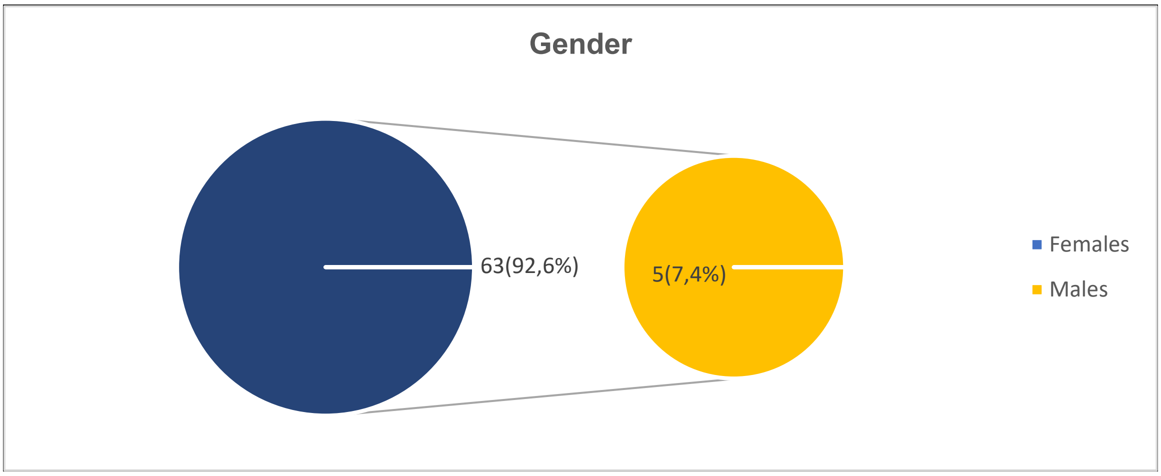

Figure 4.1: Gender of the Respondents, n=68

Figure 4.1 shows that only n=5 (7,4%) of the males participated against n=63 (92,6%) of the females this is because nursing and midwifery is female dominant. Gender was studied to ensure that both males and females were included in the study. Majority of the respondents were females because nursing and midwifery is female dominant.

- *Rank of the respondents*

Table 4.4 presents rank of the respondents who participated in the study.

Table 4.4: Rank of the respondents, n=68

Items	f and %
Operational managers	4 (5,9)
Experienced registered midwife	43 (63,2)
Newly qualified registered midwife	16 (23,5)
Neonatal intensive care trained nurse	5 (7,4)

Table 4.4 shows that n=4 (5,9 %) of the Operational Managers participated in the study, followed by n=43 (63,2%) who were experienced midwives, n=16 (23,5%) were newly qualified midwives and finally n=5 (7,4%) were neonatal intensive care trained nurses. The study found that most of the respondents were experienced registered midwives and newly qualified registered midwives.

- *Education program of the Respondents*

Figure 4.2 presents the educational program completed by respondents which ensured that all programmes were included in the study.

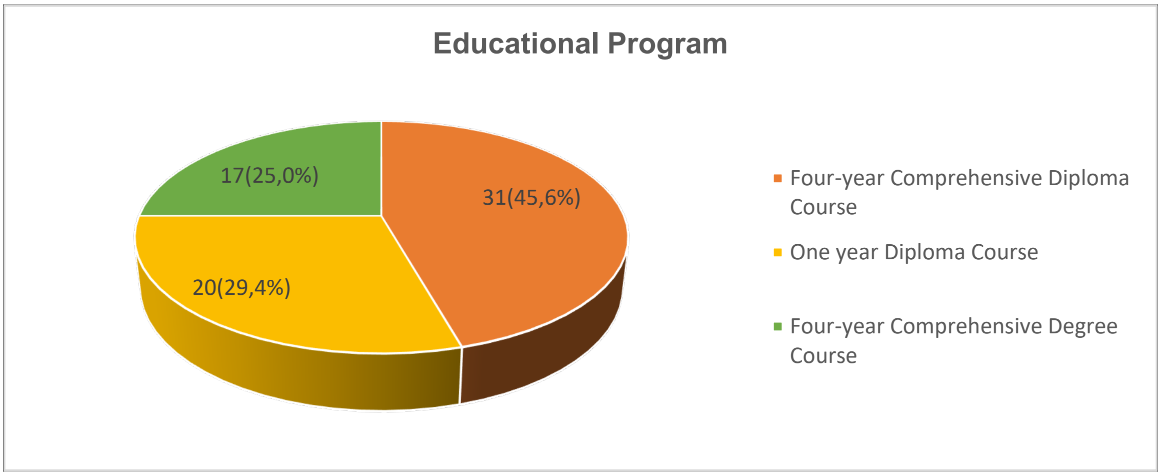

Figure 4.2: Education program completed by the respondents, n=68

Figure 4.2 indicates that most, n=31 (45.6%) of the respondents completed a four-year comprehensive diploma course, n=20 (29,4%) hold the one year diploma course, while n=17 (25.0%) respondents passed the four-year comprehensive degree course. The findings reveal that majority of the midwives completed a four year comprehensive diploma course followed by one year diploma course and a lesser number of midwives completed a four year comprehensive degree course.

- *Period of experience in NICUs*

Table 4.53 shows the period of experience in NICUs which was studied to ensure that respondents with different periods of experience were included in the study.

Table 4.5: Period of experience in NICUs

Work Experience	f and (%)
6 months	10 (14,7)
1 – 5 years	17 (25.0)
6 – 10 years	20 (29.4)
11 – 15 years	13 (19.1)
16 – 20 years	5 (7,4)
21 -25 years	0 (0)
26 and above years	3 (4.4)

Table 4.5 presents the work experience of midwives in NICUs. The data show that n=10 (14.7%) had six months of experience, and n=17 (25.0%) had between 1 and 5 years of experience. The largest group, n=20 (29.4%), had 6 to 10 years of experience. Additionally, n=13 (19.1%) had 11 to 15 years, and n=3 (4.4%) had over 26 years of experience. Notably, no respondents had 21-25 years of experience. This indicates that most midwives had more than 5 years of experience working in NICUs.

- *Training in neonatal care and resuscitation*

Table 4.6 presents the training status of the respondents in neonatal care and resuscitation.

Table 4.6: Training in neonatal care and resuscitation

Item	n	Yes f %	No f %	Total %
Helping Babies Breathe (HBB)	68	25(36.8)	43(63.2)	100
Neonatal Resuscitation	68	21(30.9)	47(69.1)	100
Management of sick and small Newborns (MSSN)	68	16(23.5)	52(76.5)	100
Limpopo Initiative for Newborn Care (LINC)	68	18(26.5)	50(73.5)	100

Out of all respondents, n=25 (36.8%) reported being trained in HBB, while n=43 (63.2%) were not. For neonatal resuscitation, 21 (30.9%) were trained, with 47 (69.1%) not trained. Regarding MSSN training, 16 (23.5%) indicated being trained, whereas 52 (76.5%) were not. Similarly, 18 (26.5%) reported being trained in LINC, while 50 (73.5%) were not.

These findings suggest that midwives were trained in various skills listed in table 4.6, but more than half of them were trained in some skills while lacking training in others. None of the midwives were trained in all the skills mentioned. There is a need for continuous training for all the midwives to be trained in all the neonatal care skills.

Table 4.7: Main causes of neonatal mortality in NICU

Table 4.7 presents the main causes of neonatal mortality in the NICUs of the selected public hospitals.

Item	Main Causes of Neonatal Mortality						
	n	Never f %	Hardly ever f %	Sometimes f %	Often f %	Always f %	Total
Low birth weight/ Prematurity	68	1(1.5)	5 (7.4)	28 (41.2)	19(27.9)	15(22.1)	100
Neonatal Pneumonia	68	0 (0)	11(16.2)	42 (61.7)	14(20.6)	1 (1.5)	100
Transient tachypnea of the newborn (TTN)	68	6 (8.8)	41(60.3)	17 (25.0)	4 (5.9)	0 (0)	100
Gastroschisis	68	7(10.3)	19(27.9)	11 (16.2)	16(23.5)	15(22.1)	100
Congenital anomalies	68	2 (2.9)	9 (13.2)	28 (41.2)	17(25.0)	12(17.7)	100
Perinatal asphyxia	68	1 (1.5)	10(14.7)	33 (48.5)	17(25.0)	7 (10.3)	100
Renal failure	68	5 (7.4)	28(41.2)	30 (44.1)	4 (5.9)	1 (1.5)	100
Neonatal sepsis	68	2 (2.9)	3 (4.4)	26 (38.2)	29(42.6)	8 (11.8)	100
Other infections	68	4 (5.9)	14(20.6)	34 (50.0)	10(14.7)	6 (8.8)	100
Gastro-intestinal diseases	68	7(10,3)	11(16.2)	40 (58.9)	10(14.7)	10(14.7)	100
Cardiac diseases of the baby	68	3 (4.4)	28(41.2)	30 (44.1)	7 (10.3)	0 (0)	100
Metabolic conditions	68	9(13.2)	11(16.2)	36 (52.9)	12(17.6)	0 (0)	100
Hypothermia of the baby	68	12(17.6)	13(19.1)	32 (47.1)	7 (10.3)	4 (5.9)	100
Respiratory distress syndrome (RDS)	68	2 (2.9)	6 (8.8)	29 (42.6)	22(32.4)	9 (13.2)	100
Persistent pulmonary hypertension of the newborn (PPHN)	68	9 (13.2)	18(26.5)	27 (39.7)	12(17.6)	2 (2.9)	100
Meconium aspiration syndrome (MAS)	68	3 (4.4)	4 (5.9)	38 (55.9)	12(17.6)	11(16.2)	100
Delayed seeking of neonatal care	68	4 (5.9)	3 (4.4)	38 (55.9)	11(16.2)	12(17.6)	100

The study investigated various factors contributing to neonatal mortality across a sample of 68 respondents. The findings reveal that low birth weight/prematurity was perceived as a significant contributor, with 1.5% of respondents indicating it never contributed, 7.4% hardly ever, 41.2% sometimes, 27.9% often, and 22.1% always. Similarly, neonatal pneumonia was identified, with none stating it never contributed, 16.2% hardly ever, 61.7% sometimes, 20.6% often, and 1.5% always contributing to neonatal mortality.

Transient tachypnea of the newborn (TTN) was cited by respondents, showing 8.8% never, 60.3% hardly ever, 25.0% sometimes, 5.9% often, and 0% always. Gastroschisis was another noted factor, with 10.3% never, 27.9% hardly ever, 16.2% sometimes, 23.5% often, and 22.1% always contributing to neonatal mortality. Congenital anomalies were reported, with 2.9% never, 13.2% hardly ever, 41.2% sometimes, 25.0% often, and 17.7% always. Perinatal asphyxia findings included 1.5% never, 14.7% hardly ever, 48.5% sometimes, 25.0% often, and 10.3% always contributing to neonatal mortality.

Other factors contributing to neonatal mortality, as reported by respondents, include neonatal sepsis (2.9% never, 4.4% hardly ever, 38.2% sometimes, 42.6% often, 11.8% always), gastrointestinal diseases (10.3% never, 16.2% hardly ever, 58.9% sometimes, 14.7% often, 14.7% always), respiratory distress syndrome (2.9% never, 8.8% hardly ever, 42.6% sometimes, 32.4% often, 13.2% always), and delayed seeking of neonatal care (5.9% never, 4.4% hardly ever, 55.9% sometimes, 16.2% often, 17.6% always).

Table 4.8: Factors that lead to poor quality neonatal care in NICU

Table 4.8 gives a summary of the factors that lead to poor quality care in NICU. Never, hardly ever and sometimes were regarded as positive responses, while often and always were regarded as negative responses.

Item	Factors that lead to poor neonatal quality Interventions						
	n	Never f %	Hardly ever f %	Sometimes f %	Often f %	Always f %	Total %
Work overload of staff	68	0 (0)	3 (4.4)	4 (5.9)	18 (26.5)	43 (63.2)	100
Shortage of staff	68	0 (0)	2 (2.9)	2 (2.9)	20 (29.4)	44 (64.7)	100
Lack of medication	68	3 (4.4)	3 (4.4)	34 (50.0)	12 (17.6)	16 (23.5)	100
Lack of equipment and supplies	68	0 (0)	5 (7.4)	33 (48.5)	10 (14.7)	20 (29.4)	100
Delayed transfer to specialised hospital	68	1 (1.5)	8 (11.8)	9 (13.2)	26 (38.2)	24 (35.3)	100
Unskilled midwives	68	5 (7.4)	30(44.1)	23 (33.8)	8 (11.8)	2 (2.9)	100
Inexperienced midwives	68	5 (7.4)	26(38.2)	27 (39.7)	8 (11.85)	2 (2.9)	100
Poor infrastructure	68	4 (5.9)	14(20.6)	29 (42.6)	18 (26.5)	3 (4.4)	100
Overcrowding of patients	68	1 (1.5)	11(16.2)	16 (23.5)	24 (35.3)	16 (23.5)	100

A significant majority of respondents (63.2%) reported that work overload often contributes to poor neonatal quality, with 26.5% indicating it occurs sometimes and 4.4% rarely. Similarly, a substantial portion (64.7%) noted that shortage of staff often leads to poor neonatal quality, while 29.4% stated it occurs sometimes, and negligible responses for hardly ever or never. Half of the respondents (50.0%) identified the lack of medication as a contributor, with 23.5% indicating it always affects neonatal care quality.

A significant proportion (48.5%) reported that the lack of equipment and supplies sometimes impacts neonatal care quality, with 29.4% indicating it often does. Respondents highlighted delays in transfers (38.2% sometimes, 35.3% often) as contributors to poor neonatal care quality. A notable percentage (44.1%) believed unskilled midwives sometimes contribute to poor neonatal care quality, with 33.8% reporting it often. Similarly, respondents noted that inexperienced midwives sometimes (39.7%) or often (38.2%) contribute to poor neonatal care quality.

Nearly half (42.6%) of the respondents indicated that poor infrastructure sometimes affects neonatal care quality, while 26.5% stated it often does. A significant number (35.3%) highlighted that patient overcrowding often contributes to poor neonatal care quality, with 23.5% reporting it occurs sometimes.

Table 4.9: Neonatal interventions for small and sick infants

Table 4.9 presents a summary of the respondents' competence in neonatal interventions for small and sick infants. Excellent and good were regarded as positive responses, while fair and poor were regarded as negative responses.

Neonatal interventions for small and sick infants						
Item	n	Excellent f %	Good f %	Fair f %	Poor f %	Total
Perform a full physical examination of the neonate?	68	45 (66.2)	20 (29.4)	2 (2.9)	1 (1.5)	100
Plan, implement and evaluate care of the neonate?	68	39 (57.4)	27 (39.7)	2 (2.9)	0 (0)	100
Monitor blood glucose	68	54 (79.4)	10 (14.7)	2 (2.9)	0 (0)	100
Monitor body temperature	68	58 (85.3)	7 (10.3)	2 (2.9)	1 (1.5)	100
Administer intravenous treatment	68	55 (80.9)	10 (14.7)	1 (1.5)	2 (2.9)	100
Perform cord care aseptically	68	54 (79.4)	12 (17.6)	1 (1.5)	1 (1.5)	100
Administer oxygen through blender	68	52 (76.5)	13 (19.1)	1 (1.5)	2 (2.9)	100
Administer of oxygen per nasal prong	68	48 (70.6)	16 (23.6)	4 (5.9)	1 (1.5)	100
Set the CPAP and put the baby on	68	42 (61.8)	21 (30.9)	5 (7.4)	0 (0)	100
Set the Ventilator and put the baby on	68	37 (54,4)	27 (39.7)	3 (4.4)	1 (1.5)	100
Management of infant on ventilator	68	54 (79.4)	12 (17.6)	1 (1.5)	1 (1.5)	100
Help the mother put the baby in Kangaroo position	68	52 (76.5)	14 (20.6)	1 (1.5)	1 (1.5)	100
Perform basic neonatal resuscitation	68	34 (50.0)	28 (41.2)	5 (7.4)	1 (1.5)	100

A comprehensive physical examination of neonates was conducted by all participants. Results showed that 66.2% of practitioners performed this task excellently, while 29.4% rated their performance as good. Fewer reported fair (2.9%) or poor (1.5%) outcomes in this category. The planning, implementation, and evaluation of neonatal care also demonstrated high competency levels, with 57.4% achieving an excellent rating and 39.7% performing at a good level. Notably, 2.9% rated their performance as fair.

Monitoring vital signs such as blood glucose and body temperature was consistently managed well, with blood glucose monitoring reaching 79.4% excellence and body temperature monitoring at 85.3%. Only minor percentages reported fair or poor outcomes in these areas. Administering treatments such as intravenous therapy and oxygen administration through various methods also showed high levels of proficiency. For instance, administering intravenous treatment achieved 80.9% excellence, while administering oxygen via nasal prongs had 70.6% excellence.

Tasks requiring specialized skills, such as setting up Continuous Positive Airway Pressure (CPAP) or ventilators, were performed competently by a significant majority, although with slightly more variability in ratings due to the complexity of these interventions. In the context of emergency care, basic neonatal resuscitation was noted to have varying levels of proficiency, with 50.0% achieving excellence and 41.2% rating their performance as good.

CHAPTER 5

INTEGRATION AND DISCUSSION OF FINDINGS

5.1 INTRODUCTION

The previous chapter discussed the presentation and interpretation of the findings of the study. The aim of the study in a qualitative and quantitative phase was explained to the participants and questionnaire respondents. The researcher obtained verbal and written consents before the data collection could comments. The purpose of the study was to develop and validate a model for midwives who care for sick neonates in NICUs of the public hospitals in Limpopo Province. This chapter presents, integration and discussion of the merged findings from both qualitative and quantitative phases. Integration is described as a deliberate process whereby the researcher brings together the qualitative and quantitative findings in a study to create a holistic understanding of a phenomenon (Fetters & Molina-Azorin, 2017; Guetterman, Fetters and Creswell (2015). Furthermore, the integration of both qualitative data minimises the weakness and maximises each strategy strength (Creswell, 2014b).

The study employed an exploratory sequential mixed-method design as consisting of first gathering qualitative data to explore the phenomenon, and then collecting quantitative data to test relationships found in the qualitative data. Furthermore, the integration of qualitative and quantitative data was done to provide a more complete understanding of the results than either approach alone. Integration of the results was done through collation to merge the qualitative and quantitative results to establish the similitude and contrast and expansion. In addition, qualitative and quantitative data then become interdependent in addressing common research questions. One key integration technique is joint displays that involve the development of a figure, table or graph to juxtapose quantitative and qualitative data or findings (Creswell, 2014b).

According to Guetterman et al. (2015), integration of data has been done primarily in two ways, that is, by writing about the data in a discussion wherein the separate results of qualitative and quantitative analysis are discussed, and by presenting the data in the form of a joint display, that concurrently arrays the qualitative and quantitative results. Joint display provides a visual means to both integrate and portray mixed - methods results to generate new conclusions. A joint display gives a method and a cognitive framework for integration, which should be an intentional process with a clear rationale. In addition, joint displays are used to enhance interpretation of the integrated qualitative and quantitative data for the readers to follow simply.

The researcher gathered qualitative data to assess the experiences of the midwives and also gathered data from the questionnaires to measure the quality of care. Therefore, the two methods of data can provide validation for each and create a solid foundation for drawing conclusions about neonatal care. The schematic presentation below (figure 5.1) indicates the integration of qualitative and quantitative result to establish the extent to which the two data sets compare and contrast. The arrows show the correlation among qualitative themes and quantitative constructs.

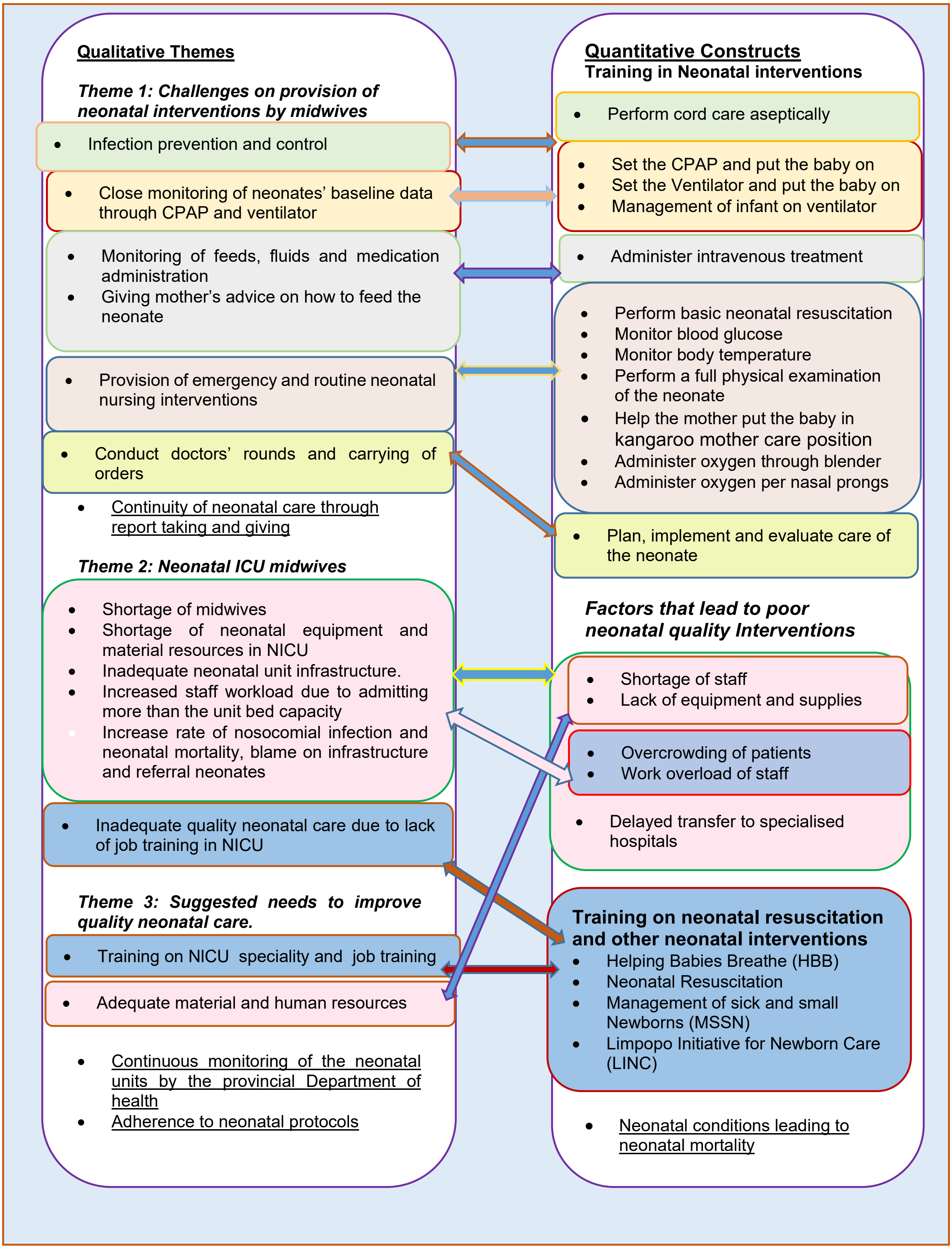

Figure 5.1 Integration of Qualitative and Quantitative findings

5.2 Interpretation and discussion of integrated findings

The findings of the study outlined in this section are the end products of the integration of the qualitative and quantitative data. The findings revealed some similarities and few differences in the themes and the constructs. The focal point of the discussion of the findings in this study was on the convergent findings from both the qualitative and quantitative findings, however, the divergent findings are also indicated.

5.2.1 Socio-demographic data

The findings revealed that majority of the participants in both qualitative and qualitative phases were females. The findings conclude that nursing and midwifery remains a female- dominant profession. Furthermore, the majority of the participants were in their middle and old age, whilst young midwives were few. The majority of the midwives completed a four-year comprehensive diploma course and one year diploma course, few midwives completed a four-year comprehensive degree course. Only 5% of the midwives were trained on neonatal intensive care nursing and they were all working in the selected tertiary hospital. None of the participants in the regional hospital were trained for neonatal intensive care nursing.

According to the first component (structure) of Donabedian's Quality of Care Model physical characteristics include education, training, experience and certification (Donabedian, 2003). Thus, midwives need to be granted the opportunities for professional development in order to be able to provide neonatal quality care to small and sick neonates. All the midwives who took part in the study had the experience of taking care of small and sick neonates, and the majority of them had more than five (5) years' experience. Melnyk (2017) indicates that due to the vulnerable population that midwives in the NICU care for, it is critical for them to stay up to date with new developments and build their neonatal nursing practice on the latest evidence available including new trends of interventions, technology, pharmacology and guidelines. Moreover, if midwives are exposed to neonatal care training as part of a program, they have to engage in continuous professional development to remain abreast of the changes and trends.

5.3 Integration between qualitative and quantitative findings

The integration between the findings of the qualitative and the quantitative phases includes the similarities that were identified during the integration of findings for both phases results. Therefore, interpretation and discussion of the integrated results from qualitative themes, quantitative constructs and literature control were presented in this part. The following similarities were identified during the integration of the qualitative and quantitative results as presented in the above figure 5.1.

5.3.1 Provision of neonatal care by midwives

Interventions to improve neonatal resuscitation are considered a priority for reducing neonatal mortality. The findings shows that the midwives render the routine neonatal care on daily basis and whenever the need arises, they also provide emergency care. Midwives try their level best to offer routine neonatal care in a high-quality manner in the midst of the challenges they encounter such as lack of human and material resource, equipment and medication. The findings of this study revealed that almost all the midwives are competent in the procedures that they perform continuously and on daily basis to small and sick neonates.

- *Infection prevention and control*

The findings revealed that about n= 66 (97%) of the midwives always adhere to infection prevention and control strategies such as hand washing, cleaning of sick babies' beds and changing of linen is their daily routine and aseptic cord care. Despite the workload and the overcrowding of neonates faced by the midwives they continue to adhere to infection control protocols. Furthermore, midwives ensured that they also trained the mothers in infection control and prevention, more especially hand washing before handling their babies and after nappy changing. However, sometimes midwives run short of the hand towels for drying their hand after hand washing and that compromised the adherence to infection prevention and control protocols.

Ramasethu (2017) agree that proper hand hygiene is the single most crucial intervention in interrupting the transmission of microorganisms and thus preventing infections. Herbeć, Chimhini, Pacareu, Sithole, Rickli et al. (2019) emphasise that poor compliance with infection prevention and control practices has been observed both in high and low-income settings and across health settings. Furthermore, they concluded that the shortage of resources is a common contributor to poor infection prevention and control practices. The findings concur with the findings of the current study. The results align with the study conducted by Kuti, Ogunlesi, Oduwole, Oringanje, Udoh, and Meremikwu (2019) who maintain that contaminated hands play a major role in nosocomial neonatal infections, more especially among preterm infants, who are very susceptible. Nosocomial infections in the NICU remains a global challenge, and the role of non-medical individuals such as mothers are under-investigated (Walker, 2020).

The World Health Organisation (WHO, 2016) concluded that one-third of nosocomial infections such as hand hygiene is preventable. According to Dramowski and Whitelaw (2017) nosocomial infections remain the most inauspicious event in neonatal care resulting in increased neonatal morbidity and mortality. Hand hygiene is an inexpensive and cost-effective way of preventing neonatal infections. Therefore, hand hygiene practices may hold strong prospects for reducing the occurrence of infections and for reducing infection-related neonatal mortality.

According to Kuti et al. (2019), the hands of mothers and health care workers harbour significant microbial pathogens acquired during contact with patients or environmental surfaces. Moreover, contact of mothers and health care workers hands with respiratory secretions, nappy change, and direct skin contacts are frequently associated with transmission of infections to the neonates. In addition, hand washing may be a more efficient and cost-effective care aimed at reducing neonatal mortality.

The United Nations (2017) concludes that through global goals termed “the Sustainable Development Goals” (SDGs), aims to end preventable deaths of neonates and children under five years of age by 2030, among other goals. This shows that the third goal of the 17 SDGs cannot be achieved without reducing neonatal mortality, and one possible way of achieving this is to substantially reduce infection-related neonatal mortality in low and middle-income countries. Careful hand hygiene may reduce these preventable deaths of neonates. Infection prevention and control practices aligns to the second component (process) of Donabedian Quality of Care Model.

- *Respiratory support of sick and small neonates*

Respiratory support in sick and small neonates admitted in NICU is of paramount importance for the reduction of mortality. Therefore, midwives need to be capable of setting the machines and taking care of neonates who are nurse on those machines. The findings revealed that midwives could manage the sick neonates on respiratory support such as CPAP (n=63, 92.7%) and mechanical ventilator (n=66, 97%). Midwives showed the ability to set and put the neonates on CPAP and mechanical ventilators. This implies that they do get in-service trainings whenever new equipment use are presented in their units, which assist in provision of quality neonatal care since all of the sick neonates in NICUs need respiratory support.

Lissauer, Duke, Mellor, and Molyneux (2017) conclude that CPAP and mechanical ventilators are important in management of respiratory distress as they prevents alveolar collapse at end-expiration, helps to stabilise the chest wall and reduce the work of breathing. Hazzani., Al Hussein., Al Alaiyan., Al Saedi and Al Faleh. (2017) believe that mechanical ventilation is an intervention that saves the lives, however, it poses some risks of injury to the lungs, brain, and other organ systems. This implies that it is very important for the midwives to have knowledge on setting the machines to minimise the risks of injury to the sick and small neonates.

Mahwasane, Maputle, Simane-Netshisaulu and Malwela (2020) maintain that small and sick neonates require close and constant monitoring as they are always changing condition and interventions should not be a routine. The majority of the small and sick neonates have respiratory distress problems requiring significant respiratory support immediately after birth or after admission to the NICU due maternal conditions effects, poor inspiratory effort, weak intercostal muscles, and poor diaphragmatic function (Shi., Muniraman., Biniwale & Ramenethan, 2020). Individualised nursing care and respiratory therapy are critical and have become increasingly widespread in NICUs. It has been demonstrated that each mechanically ventilated infant requires, on average, the care of one nurse during 60% of the time (Rocha, Soares, Gonçalves, Silva, Almeida et al., 2018).

According to Kumar., Akangire., Sullivan., Sampath and Fairchild (2020), it is increasingly observable that intermittent assessment of vital signs in NICU from review of standard bedside monitor data or medical record documentation fails to capture that analysis of continuous vital signs data can improve outcomes of neonates in the NICU. The second component (process) of Donabedian Quality of Care Model is concerned with the manner in which the systems work to deliver the desired neonatal outcome.

- *Monitoring of feeds and fluids and medication administration*

The findings revealed that about n=65 (95,6%) of the participants indicated high competence in administration of medication and monitoring of feed and fluid balance. The findings of the study revealed that midwives were monitoring neonates closely including feeds and fluids and electrolyte balance. Furthermore, midwives complied with doctors' orders by giving the prescribed medication and monitoring the neonates' feeds.

According to Ambalavanan and Nimavat (2018), fluid and electrolyte monitoring is an important and challenging part of the management of critically ill and small neonates. The transition from fetal to neonatal life is associated with major changes in water and electrolyte homeostasis. Ringer (2018) concurs with Ambalavanan and Nimavat (2018) and said water and electrolyte homeostasis in newborn infants is influenced by numerous factors, including gestational age, postnatal physiological changes in renal function, altered response to hormones, redistribution of total body water, and water loss secondary to environmental factors.

The findings indicates that the midwives also involved the mothers in management of their babies in activities such as feeding. This implies that midwives practiced family-centred approach by involving mothers in the care of their babies. According to Strandas and Fredriksen (2015), working in NICU was challenging with the demands of taking care of the infant and providing family-centred care, this included need of communication with the mother or both parents. Williams, Patel, Stausmire, Bridges, Mathis and Barkin (2018) conclude that the NICU is a particularly challenging environment for new mothers as several natural processes are disrupted. The results concur with the study conducted by Williams at al. (2018) wherein the mothers indicated that doctors and nurses were good at explaining the care given to their babies and it was reassuring for them to know that their babies were getting the best care possible. Monitoring of feeds and fluids and medication administration aligns with the second component (process) of Donabedian quality care model.

- *Doctors rounds, planning, implementation and evaluation of neonatal care*

Doctors round are critical in the management of sick and small neonates as doctors and midwives are able to plan, implement and also evaluate the care provided to the neonates. The findings implies that midwives provide care according to the doctor's orders, however, sometimes they had to act pending the availability of the doctor in order to stabilise the neonate. Furthermore, the results revealed that doctors are always there in the unit when there were no emergencies outside the unit. Osmond (2021) concludes that ward rounds are crucial as the neonatal team discusses each baby's condition and progress and a plan is made for the baby for the day and midwives will carry the doctors' orders.

Midwife-midwife handover report at the change of shifts is also an important aspect of midwifery and nursing practice linked to patient safety and quality care (Jeffs, Beswick, Acott, Simpson, Cardoso et al., 2014). Jeffs et al. (2014) study is consistent with the study conducted by Anderson., Malone., Shanahan and Manning who indicated that midwife-to-midwife report handover practices are perceived as being an crucial component in the effective transfer of neonatal care between them. It is recognised that the point where a patient is 'handed over' from one health care provider to another is significant in maintaining continuity of care and that doing this poorly can have significant safety issues for the patient. Doctors' rounds, report taking, planning, implementation and evaluation of neonatal care aligns to component (process) of the Donabedian quality care model.

5.2.2 Midwives challenges and factors leading to poor quality care

- *Shortage of human resource*

Shortage of staff remains a challenge in the NICUs of the public hospitals in South Africa, including the other low-resourced countries in Africa. This shortage of staff results in increased workload of the midwives. The findings revealed that all of the midwives who participated in the study felt that, given the workload at NICUs, there was an inadequate number of midwives on duty at any given time to deliver quality care. According to Thopola (2016), inadequate material resources and equipment compromise the competency of midwives when providing care to pregnant women which ultimately results in negative outcomes of the neonates. Adequate human is of paramount importance in provision of quality care in NICUs.

The findings disclosed that shortage of human resource have a negative impact on workload. Midwife-to-neonate ratio in NICU should be 1:2, at least one midwife should nurse a maximum of two (2) neonates, however, that is not a practice. Due to shortage of staff most of the time one midwife nurses a maximum of four (4) neonates on mechanical ventilators but still it is expected that quality neonatal care should be provided. According to the first component of the Donabedian Quality of Care Model (structure) the attributes of the service provider such as staff-to-patient ratio is important in the provision of health care. Furthermore, the Donabedian's Quality of Care Model concludes in its first component "structure" that high quality of care could be delivered only if the human and material resources are allocated and also if the infrastructure and work environment are adequate (Donabedian, 2003). Midwives could not provide quality neonatal care with an inadequate staff. Therefore, there is a need for the Department of Health to hire more midwives for provision of quality neonatal care and reduced neonatal mortality.

- *Non-functional equipment, shortage of equipment and supplies*

The findings revealed the shortage of equipment and supplies in NICUs compromise the quality of care provided to small and sick neonates. There was also an indication of lack of equipment and supplies such as incubators, monitors, medication, phototherapy lamps, ventilators, of which most of them result in prolonged waiting time for neonatal care. In addition, one NICU in Mopani district was lacking medication refrigerators, in spite of most of the medication for the neonates need be kept in a refrigerator. Midwives had to request the nearest unit to keep medication in their fridge of which it is a time-consuming factor.

The findings revealed that some of the midwives were satisfied with the available equipment, and the only problem was that there were not maintained or serviced, and they end up non-functional. Availability of functional equipment remains a challenge in the NICUs of the public hospital which impact negatively on quality of neonatal care. The study conducted by Moyimane., Matlala and Kekana (2017) found that challenges of the participants were around medical equipment that is not maintained, replaced or repaired. Therefore, shortage of medical equipment at the hospital occurred in the form of unavailability of equipment, low quality and poor maintenance of the few that were available which resulted in poor quality health care services. The findings align with the findings of the current study. The study by Usman., Wolka., Tadesse., Tariku., Yeshidinber et al. (2019) found that functional equipment and equipment distribution systems challenges were widespread. The first component (structure) of Donabedian Quality of Care Model is consent with provision of adequate equipment and supplies.

- *Inadequate NICU infrastructure*

Adequate and reliable spaces in all the five (5) study sites were a challenge. Midwives had different feelings regarding the infrastructure, some felt that the infrastructure is adequate, and others felt that it was inadequate, however, all of the midwives complained of overcrowding of neonates. According to Fischer., Schlößer., Kempf., Wichelhaus et al. (2019). overcrowding has formerly been described as a promotor of nosocomial transmission for several pathogens. All of the five (5) NICUs in the five districts of Limpopo Province had not more than a nine (9) bed capacity, however, sometimes more than nine and up to twelve neonates were admitted in NICUs. Mahwasane et al. (2020) maintain that there is a need for having adequate NICU structure for caring for small and sick neonates in needed as improper crowded units leads to complications such as neonatal infections. The findings divulged that inadequate infrastructure and overcrowding of neonates had an impact on nosocomial infections and sepsis. The sub-theme identified in the first component (structure) of Donabedian Quality of Care Model is inadequate infrastructure.

- *Increased staff workload due to increased number of admissions*

The findings exposed that the midwives experienced an increased workload in NICU due to the increased number of admissions beyond bed capacity and due to shortage of staff. Small and sick neonates are unpredictable, and their conditions can change at any given time. The neonate might change condition while the midwife is still busy with the other neonate, when the midwife noticed the change in condition such as desaturation, she might rush to save the neonate's life without doing the hand washing. However, if the midwife is allocated only one mechanically ventilated neonate, she will be able to notice whenever the neonate changes condition, even if she doesn't get time to wash hand there will be no cross infection because she would be caring for only one neonate. This implies that if the midwife-to-neonate ratio is 1:1, transmission of infection between neonates will be minimised. This also calls for hiring of more staff in NICUs.

The study conducted by Fischer et al. (2019) indicated that recently published recommendations for perinatal centres suggest a midwife-to-neonate ratio of 1:1 for neonatal intensive care, 1:2 for neonatal intensive monitored patients, which is those with non-invasive ventilation such as CPAP or blender, and 1:4 for neonatal special care. Furthermore, caring for more than two (2) neonates by the same midwife clearly increases the risk of nosocomial infections. Midwives perceived neonatal intensive care environment as hectic because most of their time they find themselves busy with neonatal care. Increased workload aligns to the first component (structure), whereas increased number of admissions align to the third component (outcome) of Donabedian Quality of Care Model.

- *Increased rate of nosocomial infections and neonatal mortality, blame on infrastructure and referral neonates.*

The findings revealed that midwives were not satisfied with the number of infections and mortality they experienced in their units. Furthermore, most of the deaths occurring in the regional and tertiary hospitals are for the neonates transferred from other hospitals as compared to the inborn neonates. The complaint on delayed transfer to specialised hospital was emphasised as the major factor for mortality of transferred neonates. There is a need for the NICUs transfer protocols to be revisited to align to the current situation or NICU environment. Transfer of small and sick neonates to a NICU for provision of specialised care has been proved to improve the neonatal outcomes, however, if neonates' transfers are delayed, conditions may deteriorate further, and complications may arise.

Complication of prematurity, perinatal asphyxia and sepsis are the most common causes of neonatal mortality. Furthermore, most of these are easy to manage and a significant decrease in neonatal mortality can occur if specialised care can be made available to these neonates. According to Ramasethu (2017), nosocomial infections threaten the survival and neuro-developmental outcomes of neonates admitted to NICU and increase cost of care. Furthermore, advances in neonatal care have led to the increasing survival of small and sick neonates, but nosocomial infections continue to be a serious problem. According to Pan (2017), transfers often occur outside of normal working hours and take place at short notice. The findings contradict with the findings of the current study.

Therefore, the NICU staff need to be empowered so that they can always be ever ready. Increase rate of nosocomial infections and neonatal mortality align to the third component (outcome) of Donabedian Quality of Care Model.

- *Neonatal intensive care, short courses and in-service training*

The findings divulged that most of the midwives allocated in NICUs were not trained in neonatal intensive care and short courses such as LINC, HBB, however, they were expected to provide care to critically ill neonates. Furthermore, the enhancement of the in-service training was also revealed by the results. About n=43 (63.2%) of the participants were not trained on HBB, n=47 (69.1%) not trained neonatal resuscitation, n=52 (76.5%) not trained on MSSN and n=50 (73.5%) not trained on LINC of which the number was unacceptably high. The Operational Manager needs to advocate for the training of midwives who care for sick and small neonates so that they can be developed and can be qualified to provide intensive neonatal care. The findings also revealed that in all the four (4) regional hospitals NICUs, there was no participants who were trained on neonatal intensive care, however, only three (3) from the tertiary hospital were trained.

According to Heerden, Maree, Yazbek, Janse van Rensburg and Leech (2019), midwives in NICU need to be trained due to the fragile population of neonates they care for. Moreover, it is important for them to be abreast with new developments and ground their neonatal nursing practice on the current evidence available. Melnyk (2017) concurs with Heerden et al.'s (2019) study results, which indicates that even if midwives are exposed to neonatal care training as part of a course or program, they have to take part in continuous professional development to remain abreast of the changes and trends. The sub-theme identified in the first component (structure) of Donabedian Quality of Care Model is.

- *Suggested solutions to improve quality neonatal care*

Midwives felt that if the challenges they encounter when nursing small and sick neonates in NICUs can be addressed, the quality of neonatal care will be enhanced and neonatal mortality will be reduced. Furthermore, they suggested that all midwives working in NICUs should be trained on neonatal intensive care speciality so that they do not apply their experience only in provision of neonatal care. The results revealed that continuous unannounced visits and monitoring of the neonatal units by the Department of Health could assist a lot as they would be able to observe how the care is being provided and the challenges they face when rendering neonatal care to the neonates. This implies that when visits such as peer-review visits are announced, the supervisors and managers try to put things in order to mask the real situation in the units and after the visits, the situation returns to the pre-visit state.

Midwives further suggested that the issue of inadequate human and material resources should be taken into considerations for the smooth running of the neonatal services. Adherence to protocols was also highlighted as the midwives believed it could also assist in the improvement of the quality of neonatal care. These cannot be achieved without adequate human and material resources including adherence to neonatal protocols. Furthermore, midwives felt that existing protocols in NICUs should be updated to suit the current situation or environment, and development of the new protocols for management of other conditions without protocols. According to El- Mashad., EL Said and Shalin (2020), all good NICUs follow a protocol-based management of small and sick neonates for uniform standard clinical care. Furthermore, consenting to follow the developed protocols serves as a catalyst for new ideas to improve neonatal care.

5.4 Summary

This chapter dealt with the presentation and discussion of qualitative and quantitative results which were analysed using the eight (8) steps of Tesch’s open coding qualitative data analysis method and SPSS software respectively as described by Creswell (2014). A consensus meeting was set between the researcher and the independent coder to discuss and agree on final themes and sub-themes based on the ones which emerged when analysing independently. Another meeting was set with the statistician who assisted with analysis of quantitative data.

CHAPTER 6

CONCEPT ANALYSIS

6.1 INTRODUCTION

Walker and Avant's method for central concept identification is part of their broader approach to concept analysis. It helps to clarify and define the central concept, making it more understandable and usable in various contexts, including the field of nursing. The steps of central concept identification are depicted in Figure 6.1.

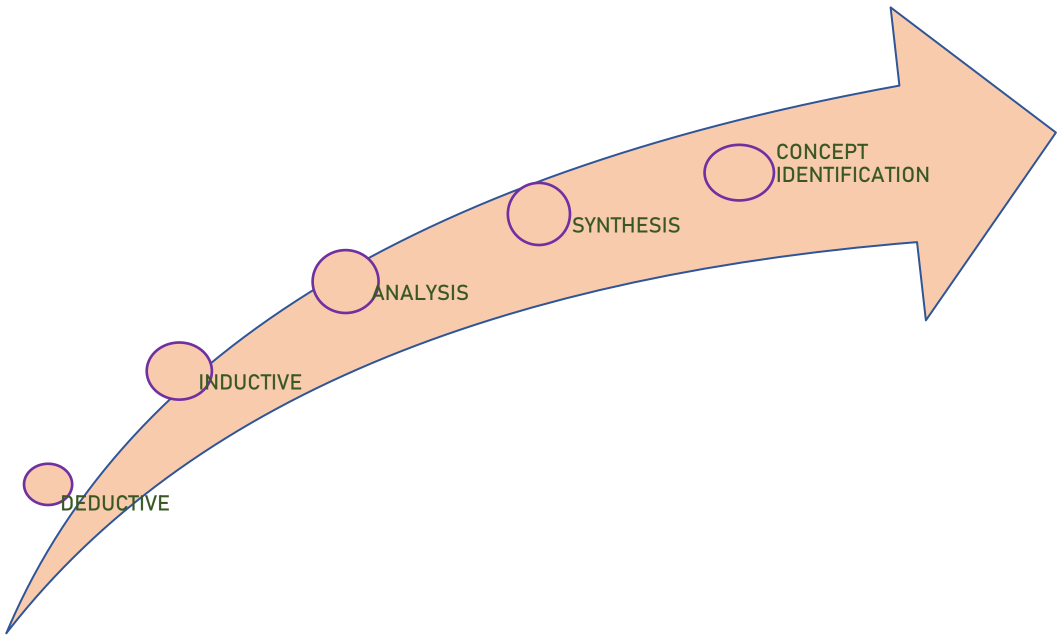

Figure 6.1: Steps of Central Concept Identification

6.2.1 Deductive reasoning

Deductive reasoning is important to operationalise the developed model. Deductive reasoning is moving from the general to the specific or from a general premise to a particular situation or conclusion (Burns & Grove,2017). Furthermore, the model should be abstract in nature to enable it to direct deductive reasoning and move from abstract concepts to well defined strategies in order to be implemented in the NICUs. Data was collected in order to establish how midwives provide neonatal care to the small and sick neonates in NICUs.

6.2.2 Inductive reasoning

Burns and Grove (2017) explain inductive reasoning as when specific concepts are combined to form the general statements. Inductive reasoning moves from the specific to the general, by which particular occasions are observed and ultimately combined into a larger whole or general statement. According to Babbie and Mouton (2011), deductive reasoning is an analytic reasoning which is used when the information needs to be generalised from a small sample to a larger sample. The findings revealed that midwives who care for sick neonates faced many challenges. Furthermore, the findings indicate that there is shortage of staff and increased workload, inadequate infrastructure, shortage of equipment and material resources , lack of maintenance of available equipment and inadequate quality neonatal care due to lack of professional development (neonatal speciality training). Consequently, the midwives often mentioned the quality care as an expected outcome. In this study, inductive reasoning was used in the process of model development to analyse the data generated from one-on-one semi-structured interviews and questionnaires to extract a concept, which is ***"Care"***.

6.2.3 Analysis

The model development commenced with concept analysis whereby the central concept was identified as well as the related concepts (Walker & Avant, 2011). The process was informed by the findings that emerged from the analysis of qualitative and quantitative data. Statement analysis was done by explaining each concept stated. Qualitative data was collected from the midwives through one-on-one semi-structured interviews. Quantitative data was collected from the midwives using a questionnaire. The collected data was analysed and integrated by obtaining similar information from qualitative and quantitative data.

6.2.4 Synthesis

The qualitative and quantitative data were collected, and the information was extracted from collected data to get the key challenges such as shortage of human resources due to high number of admissions and transfers in the neonatal intensive care units. In synthesis, collected information is used to construct a new concept. Data was collected from midwives at the five (5) selected hospitals in the five (5) districts of Limpopo Province, to enable the researcher to filter important aspects indicated during data collection. Data was audio-recorded, listened to carefully and transcribed thereof, and thereafter it was analysed to obtain important information.

6.2.5 Concept identification

Based on the central concept identification steps, lack of quality **care** was identified as a central concept. Therefore, after identification of a concept it should be selected and analysed. According to Walker and Avant (2011), concept analysis is a process that allows examination of the attributes of a concept. The aim and use of concept analysis is to differentiate the defining attributes of a concept from its unrelated attributes (Walker & Avant, 2011).

Walker and Avant (2011) identified eight steps in concept analysis namely:

- Select a concept
- Determine the purpose of the analysis
- Identify all uses of the concept
- Determine the defining attributes
- Construct a model case
- Identify borderline, related, contrary invented and illegitimate cases
- Identify antecedents and consequences
- Define empirical referent

Step 1: Select a concept

Concept selection is the initial step in concept analysis. The concept was selected through identifying the gap in practice after data analysis which was on the lack care for sick neonates by midwives. Although general references to neonatal care exist, to date no conceptual analysis work on neonatal care can be found. Walker and Avant (2011) noted some steps for their concept analysis (figure 6.1). The chosen concept was the one that the researcher was interested in, associated with the present study, manageable and convenient for the development of the model. Coughlan, Cronin and Ryan (2013) concluded that concepts selected for analysis should be relevant for practice and research of the discipline. The findings discussed under inductive reasoning revealed that there is lack of provision of quality care to the sick neonates .

The concept selected for model development in this study is the lack of quality care. The term **"care"** is usually used interchangeably with the concepts of attention, carefulness, effort, precision, meticulousness, heed and consciousness. The concept is suitable because it reflects the title and area of major interest in the current study. **Care** is a very important term as it impacts on the motivation of midwives and provision of quality neonatal care. Apart from that, a model to be developed adapted **provision of care**. Provision of care refer to the planning, application and assessment of care for neonates affected by health conditions.

- *The concept "care"*

Concepts are words, terms, or phrases that explain an abstract or concrete idea or mental image formed through a perceptual experience with the world. Furthermore, concepts serve as the building blocks for a theory. **Care** is the improvement of health via the prevention, diagnosis, treatment, amelioration or cure of disease, illness, injury, and other physical and mental impairments in people (Magqudiyane, 2022). According to the Medical dictionary (2016) care an interpersonal process involving an emotional commitment to, and a willingness to act on behalf of, a person with whom one has a significant relationship. Synonyms of caring according to Collins dictionary (2019) includes: kind, empathetic, compassion, considerate, benevolent, gentle, sensitive, sympathetic and thoughtful.

Step 2: Purpose of analysis

The purpose of this concept analysis was to clarify the meaning of care, defining a useable concept applicable in the context of neonatal care. Furthermore, the purpose of this analysis was to develop a theoretical and operational definition for care in neonatal intensive care nursing. This concept analysis is particularly important given the impact of the poor-quality neonatal care across both midwives and sick neonates (Akpotor & Johnson, 2018). Furthermore, concept analysis also assists the researcher to construct an instrument and nursing diagnosis (Chinn & Kramer, 2008; Walker & Avant, 2011).

Step 3: Uses of the concept care

According to Espeland and Shanta (2011), **care** is the core concept of nursing and it is crucial in neonatal nursing practice. According to the Magqudiyane (2022) definition care is a "feeling and concern and empathy for others showing or having compassion". Although the concept of care is global, there is no globally accepted definition thereof. It is maintained that "caring has been formalized through nursing theories and specifically through Watson's theory". Furthermore, according to the theory the concept of care encompasses that of nursing as well, in that from an ethical perspective, care is the ideal form of nursing, since its goal is the promotion of patients' health.

This concept analysis was carried out with the aid of literature on care obtained through the internet databases of CINAHL, PUBMED and PsycINFO. Walker and Avant (2011) advised that all uses of the concept of interest should be reviewed to find common themes of the concept. To distinguish the use of care in intensive care settings, a new search was conducted in accordance with recommended terms, which means that the words 'intensive care' or 'critical care' were used in PubMed, 'critical care' and 'intensive care' were used in PsycINFO.

Step 4: Determining the defining attributes

According to Walker and Avant (2011), determining the defining attributes of a concept such as care is the heart of concept analysis. The purpose is to indicate the cluster of characteristics, so-called defining attributes, which allow the best insight into the concept. Caring has an countless list of attributes some of which include **compassion, competence, confidence conscience and commitment** (Flynn, 2016). Furthermore, to relate **care** in nursing with neonatal care, expands the concept to include attentiveness, sensitivity, experience in knowledge and skills, helpfulness, improving the quality of life, and promoting dignity and nonmaleficence.

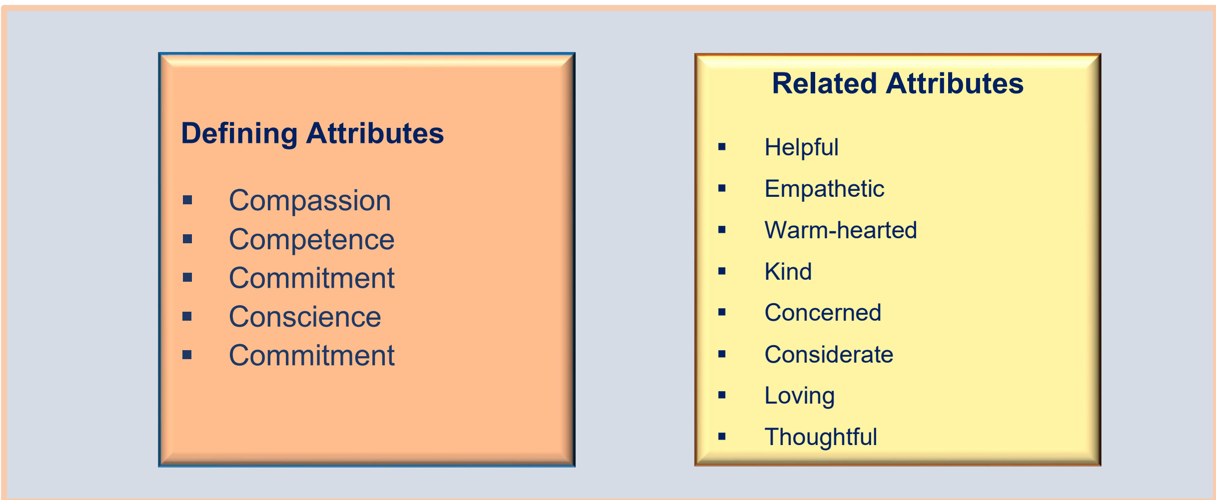

Figure 6.2: Defining attributes and relates attributes of care

- *Defining attributes*

According to Walker and Avant (2011), determining the defining attributes of a concept is the heart of concept analysis. The aim is to show the cluster of characteristics, so called defining attributes, which allow the best insight into the concept. The defined attributes of care in neonatal care includes compassion, competence, commitment, conscience and commitment.

- *Compassion*

Compassion is important for sick neonates and mothers as well as for neonatal staff. Compassion is the ability of showing empathy towards patient. Compassion means "to suffer together." Among emotion researchers, it is defined as the feeling that emanates when you are confronted with another's suffering and feel motivated to relieve that suffering. Furthermore, compassion is a feeling of pity, sympathy, and understanding for someone who is suffering. People need time and compassion from their midwives (Jasemi, Purteimor, Zabihi, Pak & Eghtedar, 2019).

- *Competence*

Competence is having the knowledge, judgement, skills, experience and motivation required to respond to the demand of one's professional responsibility and produce a successful care. Competency is "the ability to practice care that meets the needs of sick neonates cared for using logical thinking and accurate skills." The competency structure consists of four abilities: the ability to understand needs, the ability to provide care, the ability to collaborate and the ability to support decision-making. These four abilities are closely related and utilized in all types of nursing practice settings (Fukada, 2018).

- *Confidence*

Confidence has not been extensively studied but may be related to individuals' knowledge, ability to practice their skills, and other modifiable factors. Furthermore, confidence can be defined as a belief in the trustworthiness or reliability of care, and understood as a view that influences how patients make decisions. Confidence in the health care system implies an expectation that sufficient and appropriate management will be provided if needed. Kim, Arsenault, Atuyambe, Macwan'gi and Kruk (2020) conclude that to be competent, midwives need to be both knowledgeable and confident in their ability to perform necessary neonatal care.

- *Conscience*

Conscience is the core of ethical values. It helps midwives protect neonates' rights and provide quality care. In addition, it is the quality which fosters trusting relationship. Furthermore, is a state of moral awareness, a compass directing one's behaviour according to the moral fitness of situations (Jasemi, Purteimor, Zabihi, Pak & Eghtedar, 2019).

- *Commitment*

Commitment is a sense of responsibility and dedication. Commitment consists of taking a pledge towards patient and their care. Commitments underlying caring include a commitment to doing the right thing which is grounded in moral and ethical obligations, standards and policies for practice (Farlex Partner Medical Dictionary, 2012).

Step 5: Model case for caring

According to Walker and Avant (2011), model cases are 'real-life' examples of the use of a concept that include all its defining attributes. Model cases, based on the analyst's definition of the concept, are important components in concept analysis as they are exemplary cases of the concept. The researcher developed the following model case example:

Ms Rocks, a registered midwife with additional neonatal intensive care qualification, was recently employed and allocated to neonatal intensive care unit in a tertiary public hospital. The newly employed neonatal intensive care trained nurse was skilled in provision of neonatal health care services as she held some certificates for short-courses and training in LINC, HBB, MSSN and Neonatal resuscitation. Ms Rocks was handed over to the Operational Manager and was introduced to her. The Operational Manager greeted and warmly welcomed Ms Rocks and also introduced her to staff members who were on duty that day. The Operational Manager took her around to see other staff members, the physical layout of the unit and also showed her the machines used in NICU and how to operate them. On orientation day, mutual and supportive relationship was displayed by the

Operational Manager. During these introductions and orientations, Ms Rocks requested to be oriented on the guidelines, protocols and procedures used in NICU, the one midwife gladly share the information with her. Ms Rocks showed that she was knowledgeable and wanted access to information so that she could provide care according to policies and procedures. On the first day of duty in NICU, Ms Rocks was introduced to the midwives who were not on duty during her orientation. Ms Rocks was allocated a critically ill neonate who was diagnosed with severe respiratory distress due to patent ductus arteriosus. All equipment needed for provision of neonatal care were available and functional. Ms Rocks nursed only one neonate for that day, and she provided quality neonatal care because of the knowledge, skills and availability of equipment and supplies required. The condition of the neonate that was under the care of Ms Rocks improved significantly. The Operational Manager praised and appreciated Ms Rocks for the good work done who felt more empowered. The Operational Manager also encouraged other midwives to learn from her. Ms Rocks felt motivated and empowered and she became more determined to conduct her duties.

Step 6: Borderline and contrary cases for care

According to Walker and Avant (2011), borderline cases contain the most defining attributes of the concept but differ substantially in one of them. Borderline cases serve to elucidate irregularities in the application of the concept. Furthermore, they may consist of some of the critical attributes of a concept but may differ greatly in one of its attributes. Contrary cases are clear examples of what the concept is not and might be contrary to a concept. Contrary cases assist the researcher to indicate clearly, what the concept is by stating what it is not (Walker & Avant, 2011).

- *Related cases*

Concepts are connected to a network of other concepts. Related cases are examples of concepts that are related to, but not the same as the concept under study. The related cases help one understand how the concept being studied fits into the network of concepts surrounding it (Walker and Avant, 2011).

Step 7: Antecedents and consequences for caring

- *Antecedents*

Avant and Walker (2011) stated that antecedents are the events that precede the occurrence of the concept. Antecedents to the caring concepts are found in the nurse's way of being: a reflective way of being; openness, sensitivity, empathy and ability to communicate; confidence, courage and professionalism; and showing respect and supporting dignity. Antecedents are those events or incidents which must occur prior to the occurrence of the concept

- *Antecedents for the provision of quality neonatal care*

Certain antecedents must be in place for provision of quality neonatal care for sick neonates in intensive care units.

These are listed below.

- NICU Operational Manager
- Midwives,
- Infrastructure
- Equipment
- Human and material resources
- Policies
- Staff training

Human resources are required, of which they include **Operational Managers**, **midwives and neonatal intensive care specialists** as the facilitators of the model.
Adequate **infrastructure** is important for the provision of quality neonatal care. **Equipment** such as blood gas analysis machine, mechanical ventilators, CPAPs, incubators, phototherapy lamps and monitors are required. **Material resources** such medication, suction apparatus, oxygen apparatus, intubation apparatus are needed. **Policies: professional regulations** should guide the provision of a model for midwives who care for sick neonates in NICU.

- *Consequences* of the provision of neonatal care

Consequences are those elements or conditions that occur as a result of the concept. If antecedents are slightly described, consequences are described more extensive.

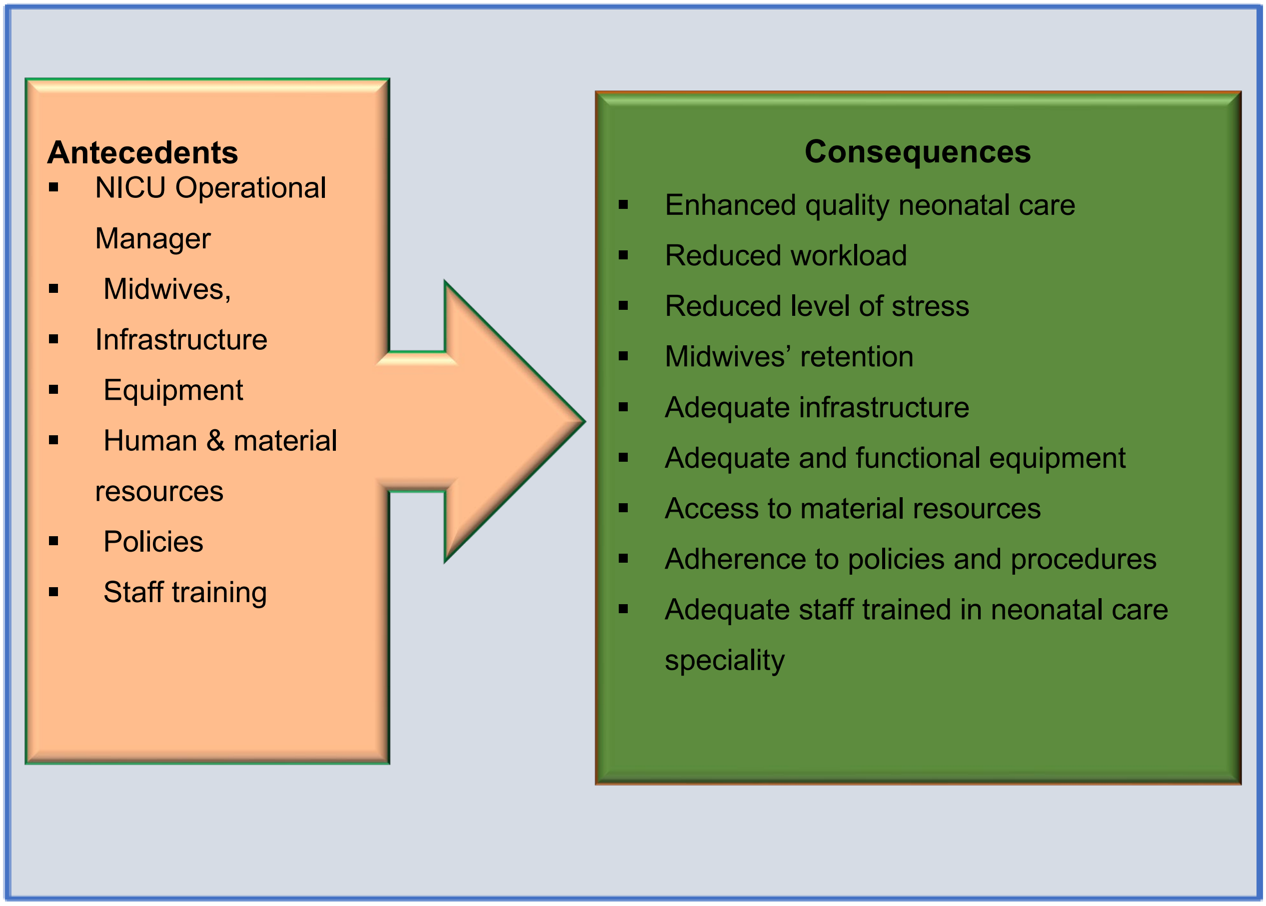

Figure 6.3: Antecedents and consequences for care

Step 8: Define empirical referents for care

Empirical referents are classes or categories of actual phenomena which by their existence or presence demonstrate the occurrence of the concept itself. Empirical referents for provision of quality neonatal care may include reduced neonatal mortality and high morale. Empirical referents answer the question 'If we are going to measure this concept or determine its existence in the real world, how do we do so?'

6.3 Classification of the main concepts for model structure

6.3.1 Practice-Oriented Theory

Practice-oriented theory is a goal-directed and order of the required actions that are essential to yield the needed outcomes (Dickoff et al., 1968). Dickoff et al. (1968) maintain that if a Practice-Oriented Theory is developed centred on empirical evidence, it guides practice. Practice-Oriented Theory guided the process of development of a model for midwives who care for sick neonates in NICUs (figure 6.1). The researcher perceived Practice-Oriented Theory as a framework through which neonatal interventions can be improved in the NICUs. The main concepts of the study identified in Figure 5.3 were classified according to the survey list developed by Dickoff et al. (1968) and defined according to a dictionary and subject definitions. The survey list highlights six activity aspects which include ways of looking at provision of care to sick neonates. All aspects of the activity list are important and should, thus, be considered to obtain a full exploration of the challenges of midwives regarding provision of neonatal intensive interventions. Six questions relating to the activity aspects are used to survey the activity and these include:

1) Agent: Who or what performs the activity?
2) Recipient: Who or what is the recipient of the activity?
3) Context: -In what context is the activity performed?
4) Procedure: What is the guiding procedure, technique or protocol of the activity?
5) Dynamics: What is the energy source for the activity?
6) Terminus: What is the endpoint of the activity?

An explanation is given below of how the general concepts and the main concepts were used to answer the questions in the survey list of Dickoff et al. (1968).

6.3.1 Agent

Dickoff et al. (1968) refer to the agent as “who or what performs the activity”? In this study, the primary agent is the NICU midwives who will be responsible for the facilitation of the model for midwives who care for sick neonates.

6.3.2 Recipient

Dickoff et al. (1968) refer to the recipient as “who or what is the recipient of the activity”? The recipients in this study are the small and sick neonate NICUs of public hospitals in Limpopo Province. The agent should ensure that the recipients receive quality care. Therefore, the recipients need to be empowered to provide high quality neonatal interventions to the sick and small neonates.

6.3.3 Context

Dickoff et al. (1968) refer to the context as “in what context is the activity performed”? The activity is performed in NICUs. The NICU is a hospital care unit that specialises in providing neonatal interventions to small and sick neonates. In this study, NICU refers to a neonatal unit that specialises in admitting and providing Level II and Level III care to small and sick neonates at Limpopo Province.

6.3.4 Dynamics

Dickoff et al. (1968) refer to the dynamic as “what energy source”? The results of the semi-structured interviews and questionnaires revealed lack of provision of quality neonatal care to small and sick neonates. The dynamics includes the following: inadequate NICU infrastructure, lack of equipment, shortage of human and material resources, staff work overload, lack of neonatal protocols and lack of NICU trained nurses.

6.3.5 Procedure

Dickoff et al. (1968) refer to the procedure as the path, steps or general patterns on the way to the accomplishment of a goal. In addition, procedure is referred to as a process that is employed to address certain problems or guide the actions to validate the model. In this study, procedure involves the provision of quality neonatal care which is the second phase of the developed model. The ***provision of quality neonatal care*** focuses on the following benefits, namely: reduced costs, reduced mortality and improved quality neonatal care.

6.3.6 Terminus

Dickoff et al. (1968) states that 'terminus' encompasses the questions to the procedure as the path, steps or general patterns on the way to the accomplishment of a goal. What will be the aim of developing a model for midwives who care for sick neonates in neonatal intensive care units in selected public hospitals in Limpopo Province? The model aims to facilitate provision of care to small and sick neonates midwives for them to improve the quality neonatal care interventions. The terminus is the third phase of model of care. In this study, terminus is the outcome for provision of quality neonatal care interventions in the NICUs of the selected public hospitals, Limpopo Province.

6.5. Summary

This chapter outlined the process of concept analysis. **Provision and Care** are the main concepts identified for the development of a model. The strategy employs the processes of analysis to extract the defining attribute of a concept. The concept analysis steps as highlighted by Walker and Avant (2011) were followed including selecting the concept, determining the purpose of analysis, identifying all uses of the concept, determining the defining attributes of the concept, identifying the model case and contrary case, identifying antecedents and consequences, and determining empirical referents. The main concepts of the study were classified according to the survey list developed by Dickoff et al. (1968). Six questions relating to the activity aspects were used to survey activity and these include agent, recipient, dynamics, context, procedure, and terminus. The following chapter explains the model for midwives who care for sick neonates in neonatal intensive care units of the public hospitals, Limpopo Province.

CHAPTER 7

A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE CARE UNITS

7.1 INTRODUCTION

This chapter focuses on the development and description of the model for midwives who care for sick neonates in neonatal intensive care units. Furthermore, it discusses the procedure followed for identification of a central concept and the steps adopted during model development. A model for midwives who care for sick neonates was developed utilising the concept analyses and the integrated findings of the study to ensure quality care by the midwives

7.2 Purpose of the model for midwives who care for sick neonates in NICUs

The purpose of the model for midwives who care for sick neonates in NICUs is to provide a rationale for the outcomes of the development of its structure and to contextualise it. The model development process was designed on the process used for theory development by Walker and Avant (2011).

The objective of this phase was:

- To develop a model for midwives who care for sick neonates in NICUs of the public hospitals in Limpopo Province.

Chinn and Kramer (2008) define a model as a creative and rigorous structuring of ideas that projects a tentative, purposeful and systematic view of a phenomena. They further proposed questions for describing a model which include:

- What is the overview of the model?
- What is the purpose of the model?
- What is the concept of the model?
- How are the concepts defined?
- What is the nature of relationship in the model?
- What is the structure of the model?

7.3 Overview of a model

The overview of a model is grounded in the model illustrated in figure 7.1 (a model for midwives who care for sick neonates in NICUs) which serves as a frame of reference for providing care to sick neonates in NICUs of the selected public hospitals in Limpopo province. The model is comprised of two (2) circles, one (1) square, one (1) cylinder, one (1) rectangle and one (1) ellipse with arrows connecting the blocks to demonstrate associations between the constituents. The triple - sided arrow in the middle between the agent and the recipient indicates the interaction among the midwives and small and sick neonates. The dynamic phase is framed in yellow and red as an indication of the potential danger the sick neonates receiving compromised quality care are embedded in. The yellow colour indicates that steps should be taken to avoid danger and green colour stands for optimal well-being. A model indicates a sequence of relationships and comprised of three phases that are composed of a flow of steps. Each step is a building stone towards the model validation. That is, Phase 1 indicates the dynamics for neonatal care, Phase 2 indicates the procedure for provision of neonatal care and Phase 3 shows the terminus of the midwives that is provision of quality neonatal care.

7.4 The purpose of a model

The generic purpose of a model is to provide the frame of reference for provision of quality neonatal care to sick neonates in NICUs. In addition, it is also purposed to speak to the midwives' challenges and assist them to provide quality neonatal care interventions to small and sick neonates in NICUs. The purpose of a model in the neonatal interventions is for it to be a practice model that guides the professional body of knowledge in neonatal care.

7.5 Identification and definitions of concepts in the model

Concept analysis was done in the previous chapter and the determinations were made regarding the concepts which were central to the model as explained by Walker and Avant (2011). The main concept as well as sub-concepts were identified from the challenges of the midwives based on the data indicated in chapter 4. Main concepts and sub-concepts were classified according to the survey list drawn up by Dickoff et al. (1968). The survey list highlights six activity aspects which include ways of looking at **provision of quality neonatal care interventions** to small and sick neonates**.** The concepts in a model for midwives who care for sick neonates in NICUs of the public hospitals in Limpopo Province included the following: context, agent, recipient, procedure, dynamics and terminus. The main concepts of the study identified in Figure 6.3 were classified according to the survey list developed by Dickoff et al. (1968) and defined according to a dictionary and subject definitions.

7.6 The nature of relationships in the model

A relationship statement links two or more concepts together (Chinn & Kramer, 2008). According to Polit and Beck (2019), a relationship is a bond or association between two or more variables. The relationship statement consists of a complete explanation of how the concepts of the model interconnect. The structure of a model emerged from the relationships between the six main concepts. Every concept of a model for midwives who care for sick neonates in NICUs of the selected public hospitals in Limpopo Province are interconnected. The interconnection of results in convergence of concepts into a single concept, "**provision of quality neonatal care**", which shows the purpose of a model.

7.7 Description of the structure of a model

Model development is a systematic organisation of the links in a formal coherent theoretical structure. The assumptions of the researcher must be very clear, since these have a significant influence on the outcomes and interpretations of this process. The structural components of the conceptual model corresponded with the specifications (or 'agents') described by Dickoff et al. (1968): the purpose (goal or endpoint of the activity); an agent (who is responsible for the activity); a recipient (who receives the activity); a framework (context in which the activity takes place); dynamics (the energy source of the activity); and a procedure (procedure, technique or protocol of the activity).

According to Chinn and Kramer (2008), the structure of a model addresses the general form of conceptual interrelationships. The structure of a model for midwives who care for sick neonates in NICUs of the selected public hospitals in Limpopo Province has one fundamental structure. The major characteristic of a model is that it was designed in a flow chart format. The steps are indicated inside the circles, rectangles, ellipses and cylinder. The frame around the model represents the context in which a model will be implemented, that is the regional and tertiary NICUs. The two circles represent the agent and the recipient. The rectangle in the centre represents dynamics that need to be addressed for quality neonatal care to take place. These are critical forces that influence the process, agents and recipients, and goal or terminus of the process. The left-hand side and middle circles represent the recipients of the activity and the agents.

The rectangle and a single sided arrow represent the procedure or the process of quality care, which are cyclical and imply that if the objectives of quality care are not achieved, the process should be repeated, starting with analysis. The two (2) ribbon arrows from the dynamic to the process and one (1) sided arrow from the process to the terminus indicates the direction of the process to the terminus or end point. The three-sided arrow indicates the interaction between the midwives and neonatal intensive care trained nurses with the sick neonates A model is a simple chain of relationships with the flow of actions and three phases. The visual presentation of the model is in colour, red colour as an indication of potential danger the sick neonates receiving compromised quality care are embedded in, yellow colour indicates that steps should be taken to avoid danger and green colour stands for optimal well-being and positive outcomes.

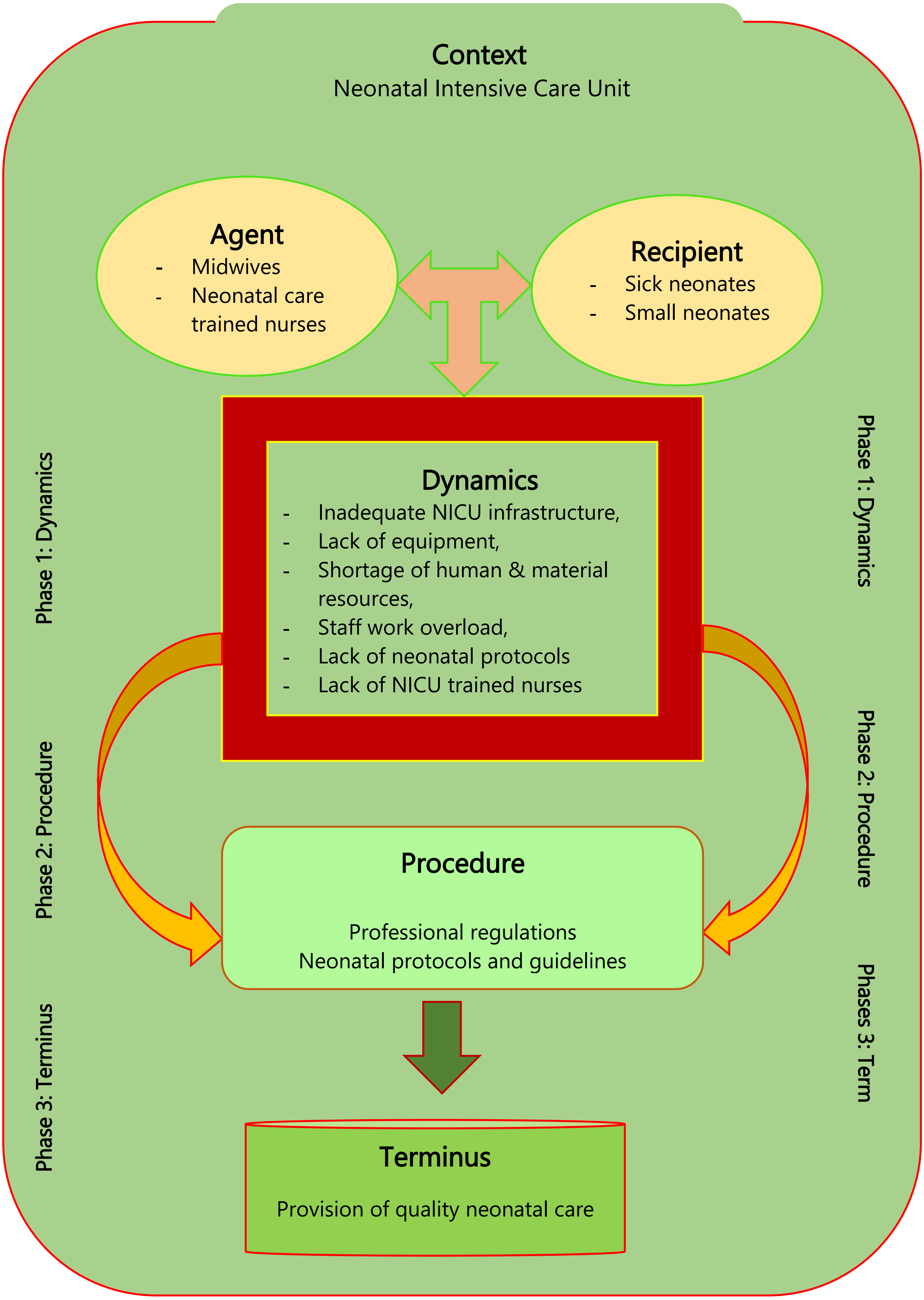

Figure 7.1: A Model for midwives who care for sick neonates in NICUs

7.7.1 Context of the study

Dickoff et al. (1968) refer to context as “in what context is the activity performed”? The context represents the setting where the activity takes place. The specific context in this study was the neonatal intensive care units in the regional and tertiary hospitals of the province providing Level II and Level III neonatal intensive care to the small and sick neonates. The context is comprised of the Operational Manager, midwives and neonatal intensive care trained nurses and it is governed by the WHO guidelines, National and Provincial DoH policies, South African Nursing Council rules and regulations as well as the contextual protocols and procedures. Context is part of the Practice -Oriented Theory as described by Dickoff et al. (1968). The model was developed for the neonatal ICU staff in the Limpopo Province. Figure 7. 1 illustrates the context in which the model would be implemented.

The activity is performed in the NICUs which are responsible for providing intensive care to small and sick neonates in Limpopo Provinces. The NICU is a hospital intensive care unit that specialises in looking after the small and sick neonates. The provision of quality care of the small and sick neonates will take place in these contexts. The context consists of five (5) selected neonatal intensive care units of public hospitals in which small and sick neonates were admitted for health care services in which midwives executed their duties. Out of five (5) selected public hospitals, one NICU was tertiary and four (4) were regional hospitals. These NICUs provide intensive care small and sick neonates for 24 hours on daily basis. Regional NICUs receive small and sick neonates from the peripheral hospitals and the tertiary hospital receives from regional and nearby district hospitals for specialised care in order to minimise neonatal mortality and enhance quality neonatal interventions as the target of the SDGs.

Figure 7.1 illustrates the context that consists of legal frameworks, an empowering environment with resources and management support, as well as policies and procedures that include the provision of quality neonatal care. Furthermore, it is important to understand the context of selected public hospitals in relation to the genealogy of the DoH policy framework and existing approaches of service provision in the hospital. Public hospitals fall under the mandate of the DoH, which operates under the legal framework of the South African Government. In provision of quality neonatal care, it is pivotal to understand the policies that shape the day-to-day activities at the NICUs of public hospital. The link between the legal frameworks, together with the health context policies and procedures needs to be established with the view of supporting midwives to improve quality neonatal interventions delivery.

Public hospitals consist of Level III hospitals that are providing specialised services, as well as regional and with different abilities to provide quality neonatal interventions to the small and sick neonates. NICUs provide neonatal care and services at different levels with different inputs and resources at their disposal. In the Limpopo Province, public hospitals are categorised according to a specific level of care and service delivery. The regional hospitals provide unique services with few specialties that focus mainly on internal medicine, obstetrics, gynaecology, paediatrics and general surgery. All specialised cases are referred to a tertiary level hospital for intensive care management. The district hospitals transfer their patients to regional hospitals and tertiary hospital for nearby hospitals. NICUs face different challenges that stifle quality neonatal care delivery, such as inadequately trained staff, poor infrastructure and inability to provide the needed care and services, increased staff workload and overcrowding of neonates in NICUs.

7.7.2 Agent of a model

The agent refers to the person that performs the activity (Dickoff et al.,1968). The agent in this study referred to the Midwives in the NICU. To provide quality neonatal interventions agents need to be empowered in order to become experts in quality management with the capacity to work independently, as well as to generate and analyse information for planning and decision-making purposes at the hospitals. The agent should be able to design, plan, implement, monitor, and evaluate a quality neonatal care provision. The agent should be hard-working, committed, and passionate about quality improvement, assertive, inventive, approachable, honest, trustworthy, self-motivated, energetic, attentive, knowledgeable, and proficient to handle the situations in relation to quality in NICUs.

7.7.3 Recipient of a model

The recipient refers to the person to whom the agent performs an activity (Dickoff et al., 1968). In this study, the recipient referred to the sick neonates who are admitted in NICUs of the public hospitals in Limpopo Province. Therefore, the recipient needs to be provided with high quality neonatal care. Figure 7.1 illustrates the recipient as the beneficiary of a model for midwives who care for sick neonates in NICUs of the public hospitals in Limpopo Province. Results revealed that the midwives are face challenges with provision of quality neonatal care to small and sick neonates. These include inadequate staff, lack of equipment and material resources, lack of speciality training staff work overload and patients overcrowding, and leave them fatigued and weary.

7.7.4 Phase 1: Dynamics of a model

The dynamics refer to the internal motivations of the agent and the recipient that have an influence on reaching the expected outcomes of the agent (Dickoff et al., 1968). The dynamics referred to inadequate NICU infrastructure, lack of equipment, shortage of human and material resources, staff work overload, lack of neonatal protocols and lack of NICU trained nurses. The results of the semi-structured interviews and questionnaires revealed lack of equipment and material resources hindered the midwives to provide quality neonatal care to small and sick neonates. The dynamics in this study were the challenges that the midwives were experiencing in terms of interferences with the provision of quality neonatal care. Dynamics were based on the information shared by the midwives as forming the source of power. If outstanding factors such as the source of power are not managed well, it might hinder the provision of quality neonatal care at the neonatal intensive care units.

7.7.5 Phase 2: Procedure of a model

The procedure refers to the process of the activity performed by the agent (Dickoff et al., 1968). Midwives and neonatal intensive care trained nurses provide quality neonatal care to sick and small neonates in NICU. In this study, procedure involves the professional regulations and neonatal protocols and guidelines which is the second phase of the developed model..

7.7.6 Phase 3: The terminus of a model

The terminus refers to the outcome of the procedure performed by the agent to the recipient (Dickoff et al.,1968). Midwives provide quality neonatal care interventions to sick and small neonates in NICUs. In this study, the term terminus, referred to the endpoint of the model development, which completed the activities in the cycle of developing the model for midwives who care for sick neonates in NICUs is described by Dickoff et al. (1968). Figure 7.1 illustrates the final activity of Dickoff's (1968) Practice - Orientated Theory, since the terminus completes the model development process. Terminus refers to the results of the procedure performed by the agent to the recipient. As the final activity of the process. The terminus of a model incorporates provision of quality neonatal care.

7.7.7 Assumptions of the model

The model is grounded on the assumption that a model for midwives who care for sick neonates cater for the whole being of the midwives. Provision of neonatal care can be achieved if the nursing service management, the midwives and neonatal intensive care nurses work together in harmony. The implementation of a model for midwives who care for sick neonates is central to midwives and neonatal intensive care trained nurses who care for sick neonates in NICUs. Thus, Midwives must promote the provision of quality neonatal care to the small and sick neonates in NICUs.

7.7.8 Guidelines for utilisation of a model for midwives

The guidelines for utilisation of a model for midwives who care for sick neonates are outlined in this section. The following guidelines were developed to direct operationalisation of a model for midwives who care for sick neonates in NICUs:

- *Context guidelines*

The following guidelines are constructed for the context of a model for midwives:

- The context is the midwifery in Limpopo Province where midwives utilise a model for midwives during provision of neonatal care, however, the specific context is the NICUs.
- The context should be assessed broadly in order to be aware of events that occur in the context.
- Operational Managers should conduct in-service training to orientate the midwives to determine the feasibility of a model.

- *Agents' guidelines*

The following guidelines are constructed for the agents of a model for midwives:

- The Midwives are agents to the small and sick neonates.
- The Midwives as an agent to the small and sick neonates learn how to use a model in provision of neonatal care.
- The midwives should encouraged one another to use a model for improvement of the outcomes.
- Midwives as the agents to the sick and small neonates should be well trained to provide quality neonatal care.

- *Recipients' guidelines*

The following are the guidelines for the recipient of a model:

- Neonates are recipients of the midwives.
- Midwives should be willing to be develop, for example through training.
- Small and sick neonates should receive quality neonatal care from the midwives.

- *Dynamics guidelines*

The following are the guidelines for dynamics of a model:

- The Operational Managers should advocate for more staff establishment in order to minimise increased staff workload.
- Midwives should be determined to accept the learning opportunities so that they can be empowered.
- The agents and the recipients should be willing to take part in quality care activities to achieve the required outcomes.
- The Operational Manager should advocate for renovations of the NICU to increase the space.

- *Procedure guidelines*

The purpose of the model for midwives who care for sick neonates in NICU is to enhance the quality of neonatal.

- The agent (midwives) should comply with regulations, procedures and neonatal protocols to guide the provision of neonatal care.
- The agent should ensure that guidelines and protocols that are guiding neonatal care are revised to fit the current situation.
- The agent should be granted an opportunity of training with neonatal care skills.

- *Terminus guidelines*

The results of the agent, recipient, and context should yield the following:

- The terminus of a model for midwives is provision of quality neonatal care.
- Quality of neonatal care should be improved
- Neonatal mortality should be reduced.
- Midwives should be trained on neonatal care skills
- Infrastructure should be renovated to enlarge the space and to suit the current situation and equipment.

7.8 Summary

This chapter discussed model development of which activities were categorised using the six steps as described by Dickoff et al. (1968). The structure of a model was outlined based on the following steps namely, context where the activity was performed, agents who performed an activity, the recipients who received the activity from the agents, the dynamics which stumbling blocks for activity to be performed, smoothly, the procedure which guides the activity and lastly the terminus which is the end product or outcome. Provision of quality neonatal care was viewed as a set form and operating procedure to enhance neonatal care services. Guidelines for utilisation of a model for midwives who care for sick neonates were formulated. Validation of a model will be discussed in the next chapter.

CHAPTER 8

MODEL VALIDATION PHASE

8.1 INTRODUCTION

This chapter presents the validation of a model which was developed in chapter 6 after data collection and analysis and integration of the qualitative and quantitative data. The final step of the development of the model was to have the model evaluation to identify its trustworthiness, strengths and weaknesses through review by experts in the field of maternal-newborn care. The validation criteria by Chin and Kramer's (2008) validation criteria was used to determine the understanding on how well a model of care relates to practice, research, and education. This chapter also discusses the model validation to achieve objectives of the study as discussed in chapter 1 of this study.

8.1.1 Objectives of this phase

- The objective of this phase was to validate a model for its relevancy to neonatal health care services in NICUs.

Validation and replication interact to provide a means of forming clear and accurate understanding of empirical knowledge (Chinn & Kramer, 2008). In addition, they indicated that immediately after the model is described, the researcher should pose an important question to provide information on how the model serve certain purposes. The researcher should have an understanding on how the model will be utilised and how it might be improved. Chinn and Kramer (2008) concurred with the phrase when they argued that realistic knowledge can be legitimated through validation.

8.2 Criteria for validating a model for midwives who care for sick neonates

The current study adopted Chinn and Kramer (2008) to validate the model by posing the following consecutive questions:

- How clear is the model?
- How simple is the model?
- How general is the model?
- How accessible is the model?
- How important is the model?

8.2.1 How clear is a model for midwives who care for sick neonates?

Chinn and Kramer (2008) refer to clearness as to how well the theory can be understood and how consistently ideas are conceptualised. In this study, the researcher took into consideration the semantic clarity and structural clarity to determine how the model is (Chinn & Kramer,2008). In semantic clarity, concepts were defined using terms that have common meaning within the nursing profession (Chinn & Kramer, 2008). In structural clarity, the researcher discussed components of structures in the model and their relationships to provide a clearer understanding of how the structures integrate with each other (Chinn & Kramer, 2008).

In determining how comprehensible a model is and to create an understanding of the model, the panel of experts was asked how clear a model for midwives who care for sick neonate is? A total of n=10 (63%) experts agreed that the model for midwives who care for sick neonates is clear**.** Another academic added that the concepts are clearly defined and applied to the study to connect with the process. One expert said that "the structure is simple, clear and easy to follow. The structure is clearly stated, and the diagrams support one another**".** A total of n=6 (37%) of the experts indicated that the concept of agent and recipient were not clear. One expert said "the model is graphically portrayed well and is cohesive. It contains the context, inputs, process as well as the expected outcomes, however, agent and recipient concepts were not clear."

8.2.2 How simple is a model for midwives who care for sick neonates?

According to Chinn and Kramer (2008), simplicity is the minimal number of components within the descriptive classification, particular concepts, including relationship among them. In this study, major concepts such as quality neonatal care, and small and sick neonates as well as their interrelationship, were used as a guide to health care practice (Chinn & Kramer, 2008).

All 16 (100%) experts agreed that the model for midwives who care for sick neonates was simple to follow as evidenced by one academic who said "The number of elements and concepts are minimal and were used accordingly, it shows the flow of the model. The discussion was clear with the purpose of the model. The schematic presentation is easy to follow and explained in detail and their relatedness is highlighted in the description of the model. The relational components were discussed from the selected concepts".

8.2.3 How general is a model for midwives who care for sick neonates?

Chinn and Kramer (2008) refer to generality as the broadness of the scope of concepts and purpose within a model. This study addressed the significance of provision of quality neonatal care to sick neonates. A total of n= 8 (50%) experts agreed that the model for midwives who care for sick neonates is general and can be applied to a broad array of situations. The same number of participants, n=8 (50%) suggested that model should focus on midwives and nurses working in NICU to be general.

8.2.4 How accessible is a model for midwives who care for sick neonates?

According to Chinn and Kramer (2008), accessibility is the degree to which concepts within the theory or model can be identified and the approach in which the expected outcome can be achieved. In this study, the definition of concepts was the guide to the accessibility of the model.

8.2.5 How important is a model for midwives who care for sick neonates?

Chinn and Kramer (2008) conclude that the importance of the model grounds on the personal and professional values in nursing practice, education and research. The current study addresses the extent to which midwives' contributes to the enhancement on the provision of quality neonatal care. All n=16 (100%) experts agreed that the model for midwives who care for sick neonates is of importance to neonatal intensive care practice. One expert indicated that "*utilization of a model will results in productive midwives*". A model was refined according to the comments.

8.3 Validation methodology

A qualitative and quantitative validation design was used for collection of data from the neonatal health care experts regarding a model for midwives who care for small and sick neonates for enhancing quality neonatal care. The data collection instrument consisted of leading questions and experts were requested to give their comments in the form of narrating.

8.3.1 Population and sampling

The study population consisted of experts in neonatal health care and model development. This included neonatal intensive care trained nurses and midwives working in NICUs of public hospitals, experts from the Limpopo Department of Health, and university academics. Purposive sampling was employed to select the experts who participated in validating the model for midwives caring for sick neonates in NICUs.

The sample comprised eight experienced midwives (7 to 10 years in NICU practice), four neonatal intensive care trained nurses, two academics with model development expertise, and two experts from the Limpopo Department of Health. To be included in the study, participants needed to have at least a doctoral degree and be recognized by their peers or through scientific publications as knowledgeable in neonatal intensive care nursing or model development. Participants were recruited through both online and face-to-face methods. Therefore, the experts included in this study possessed the necessary qualifications to provide relevant information for the validation of the model.

The study population comprised experts in neonatal health care and model development. These experts included neonatal intensive care trained nurses and midwives working in NICUs of public hospitals, experts from the Limpopo Department of Health, and academics from a university. Purposive sampling was employed to select participants for the validation of the model for midwives caring for sick neonates in NICUs. The sample consisted of eight (8) midwives who were highly experienced (7 to 10 years' experience in NICU practice), four (4) neonatal intensive care trained nurses, two (2) academics with model development experience and two (2) experts from Limpopo Department of Health. Eligibility required participants to hold at least a doctoral degree and be recognized, either through scientific publications or professional reputation, as knowledgeable in neonatal intensive care nursing or model development. Recruitment methods varied, with some experts being contacted online and others face-to-face. Therefore, experts included in this study had the required characteristics to provide relevant information regarding validation of a model.

8.3.2 Data collection

Respondents were recruited online via emails, while others were recruited face-to-face. They also were requested to participate in validation of a model for midwives who care for sick neonates in NICUs. In addition, the researcher checked for availability of the experts and their willingness to participate in the study. The researcher contacted the participants who were recruited through emails on their cell phones to explain the purpose of the study and to present the model to them. The respondents who gave consent to participate in the study were emailed the model validation questionnaires, guidelines for utilisation of a model, consent form and concept analysis and the model development chapter. These were used for reference purposes while the researcher was presenting over the phone. Respondents who were recruited face-to-face were also taken through the purpose of the study and the description of the model. Respondents who gave consent to participate in model validation were given the hardcopies of the model validation questionnaire, guidelines for utilisation of a model, consent form, concept analysis and model development chapters were administered for reference while the researcher was presenting.

The model validation instrument was developed according to the Chinn and Kramer (2008) approach. The questionnaire (Appendix xix) consisted of the leading questions which required respondents to tick yes or no responses and a column for remarks was also provided. The researcher clarified with the respondents where necessary and granted the respondents an opportunity to sign the consent form. All sixteen (16) questionnaires were completed and submitted to the researcher. Four (4) experts completed the questionnaires and emailed them back within 3 to 5 days.

8.3.3 Data analysis

The IBM Statistical Package for Social Sciences (SPSS) version 25 software was used for data analysis. Descriptive statistics were used to describe the collected data. Numeric and narrative data collected from experts in the field of neonatal health care was analysed and presented in frequencies and percentages.

8.3.4 Model validation results

a) Demographic data

The demographic data of the respondents is presented in the table below.

Table 8.1 Section A: Demographic data of the respondents

Respondents' Demographic data, N=16	f	%
Midwives	8	50
Neonatal intensive care trained nurses	4	25
Model validation experts	2	12.5
Limpopo department of health experts	2	12.5
Total	**16**	**100**

8.3.5 Data distribution

Table 8.2 Section B: Data distribution

No	Data Distribution	Yes		No		Remarks
	Semantic clarity and consistency	f	%	f	%	
1	Is the concept of "Agents" clear in a model?	14	87,5	2	12,5	Operational manager should be the agent
2	Is the concept of "Recipients" clear in a model?	14	87,5	2	12,5	Midwives are the recipients
3	Is the concept of "Dynamics" clear in a model?	16	100	-	-	Well presented
4	Is the concept of "Procedure" clear in a model?	16	100	-	-	Well presented
5	Is the concept of "Terminus/outcome" clear a model?	16	100	-	-	Well presented
6	Are definitions consistent with one another?	16	100	-	-	Well presented
7	Are assumptions and purposes compatible with other elements in the model?	16	100	-	-	Well presented
	Structural clarity and consistency					
1	Is the context of a model for midwives who care for sick neonates in NICUs clearly described?	16	100	-	-	Well presented
2	Is the goal of a model for midwives who care for sick neonates in NICUs clearly set?	15	93,8	1	6,25	The focus should be on the midwives
3	Do all relationships fits within the structure of a model?	15	93,8	1	6,25	
4	Is the model graphically portrayed well in the form of a visual presentation?	16	100	-	-	Well presented
5	Do diagrams and structures provide support for one another?	16	100	-	-	Well presented

6	Is there any interconnection between the concepts used in the model?	16	100	-	-	Well presented
7	Is there any evidence of logic coherence on the frame of reference of the model	16	100	-	-	Well presented
	Generality and Importance					
	Is the model for midwives designed in broad implications to make it applicable in different disciplines?	14	87,5	2	12,5	The model should focus on midwives and nurses, not other disciplines
	Does the model have the potential to influence neonatal health actions?	16	100	-	-	Well presented
	Will application of a model for midwives in NICUs resolve neonatal care challenges	16	100	-	-	Well presented
	Are the concepts within the domain of nursing?	16	100	-	-	Therefore, the model should focus on nursing and midwifery
	Is a model for midwives in NICUs addressing the realities of the situation	16	100	-	-	Well presented
	Is a model leading to the terminus of quality neonatal care?	16	100	-	-	Empowered midwives will be productive.

8.2.5 Responses of model validation

Table 8.2 summarises the responses gathered during the model validation phase. The study involved a total of 16 participants (100% response rate): 8 midwives (50%), 4 nurses with neonatal intensive care training (25%), 2 model development experts (12.5%), and 2 experts from the Limpopo Department of Health (12.5%). Out of the participants, 14 (87.5%) agreed that the model clearly outlined the processes needed to achieve the desired outcomes. All 16 participants (100%) concurred that the model adequately addressed the various dynamics impacting the delivery of quality neonatal care.

However, 2 participants (12.5%) suggested revising the roles within the model by removing midwives as agents and keeping them solely as recipients, and excluding sick and small neonates as recipients since the model focuses on midwives. Nonetheless, all respondents (100%) affirmed that the model's processes were consistently applicable in practical settings (see Table 8.2). Furthermore, every respondent (100%) found the model straightforward to understand and believed it effectively emphasized the significance of high-quality neonatal care. All 16 respondents (100%) also expressed the opinion that the model is important and addresses the improvement of quality neonatal care (see Table 8.2).

Based on the expert feedback, the model was refined accordingly. The consensus among the participants, including midwives and neonatal intensive care trained nurses, suggests that the developed model and the proposed guidelines for its implementation are suitable for enhancing the quality of care provided to sick and small neonates.

Table 8.2 presents the responses of model validation. The study comprised of sixteen 16 (100%) respondents, 8 (50%) were midwives, 4 (25%) were neonatal intensive care trained nurses, 2 (12,5%) were model development experts and 2 were (12.5%) were Limpopo Department of Health experts. About 14 (87,5%) respondents agreed that the model was clear on the process to yield the expected outcomes. All 16 (100%) respondents agreed that the model presented sufficient dynamics that affect the process of provision of quality neonatal care.

About 2 (12,5%) respondents suggested that midwives be removed as an agent and remain as a recipient, and that sick and small neonates be removed as recipients since the focus of the model is on the midwives. All 16 (100%) respondents agreed that the process in the model is consistent to the extent that it can be practically applied (see table 7.3). All of the 16 (100%) respondents agreed that the model was simple to understand. They also agreed that the model addressed the importance of quality of neonatal care. Moreover, 16 (100%) respondents agreed that they think this model is important; 16 (100%) respondents agreed that the model addresses the enhancement of the provision of quality neonatal care. (see table 7.3).

Therefore, the model was refined based on the comments from the experts. Moreover, it can be concluded that all midwives and neonatal intensive care trained nurses engaged on the model developed and guidelines suggested for implementation of a model. Expectations are that experts' response revealed that they reached consensus that a model for midwives who care for sick and small neonates can be utilised to enhance the quality of neonatal care.

8.3 Summary

Chapter 8 outlined the validation of a model for midwives who care for sick neonates in NICUs which is recommended for enhancing the quality of neonatal care. The process of validation includes the following criteria: how clear is the model? how simple is the model?; how general is the model?; how accessible is the model?; and how important is the model? The process of validation also involved the population, sampling, data collection and data analysis. The experts in the field of study were recruited to participate in the model validation. Purposive sampling was used to select experts who participated in the validation of a model for midwives who care for sick neonates in NICUs. Respondents who agreed to participate in model validation were given an opportunity to sign a consent form. Data was collected through the questionnaire via email and face-to-face contact. Data was analysed using the SPSS version 25 software. The model was refined according to the suggestions of the experts. The validation was guided by Chinn and Kramer's (2008) criteria for model validation. Chapter 9 will focus on summary, limitations, recommendations and conclusion.

CHAPTER 9

SUMMARY, LIMITATIONS, RECOMMENDATIONS AND CONCLUSION

9.1 INTRODUCTION

This chapter discusses the summary of the study, identified limitations of the study, conclusions drawn from the study, and recommendations cited for the utilisation of a model for midwives who care for sick neonates in NICUs. The recommendations were formulated based on the findings of the study in relation to research and neonatal intensive care practice.

9.2 Summary of the study

The aim of the study was to develop and validate a model for midwives who care for sick neonates in the NICUs of the public hospitals in Limpopo Province. The aim was accomplished through exploring the challenges of midwives regarding the neonatal care they provide to sick neonates in the NICUs of public hospitals, Limpopo Province . The exploratory, sequential mixed - method design was used in the study. The design started with qualitative data collection utilising one-on-one semi-structured interviews and analysis was done thereof using Tesch eight steps. The development of a model was based on the integrated findings from both qualitative and quantitative methods. The model was therefore validated by experts in the field of neonatal care services and the guidelines were also developed for utilisation of a model. The study comprised of four objectives which were divided into three phases.

9.3 Phase 1: Empirical phase

9.3.1 Qualitative phase

The purpose of the qualitative phase was to obtain in-depth information regarding the challenges faced by midwives when rendering neonatal care to sick neonates in NICUs. The objective of the qualitative phase was to explore the challenges faced by midwives regarding the neonatal care they provide to sick neonates in the NICUs of public hospitals, Limpopo Province. The objective was achieved by qualitative data collection whereby participants were midwives working in NICUs of the public hospitals in Limpopo Province.

The three (3) themes emerged from the qualitative data are:

Theme 1: Provision of neonatal care by midwives.

Seven (7) sub-themes emerged from this theme namely, infection prevention and control, close monitoring of neonates' baseline data through CPAP and ventilator, monitoring of neonates' feeds, fluid and electrolyte balance and medication administration, provision of emergency neonatal care, conduct doctors' rounds and carrying of orders, giving mothers advice on how to feed the neonate and continuity of neonatal care through report taking and giving.

Theme 2: Neonatal ICU midwives challenges.

Six (6) sub-themes emerged from this theme namely, shortage of midwives, shortage of neonatal equipment and material resources in neonatal ICU, inadequate neonatal unit infrastructure, increased rate of nosocomial infection and neonatal mortality, blame on infrastructure and referral neonates, increased workload due to admitting more than the unit bed capacity and inadequate quality of neonatal care due to lack of job training in neonatal ICU.

Theme 3: Suggested solutions to improve quality neonatal care.

Four (4) sub-themes emerged from this theme namely: training on neonatal intensive care speciality and on the job training, continuous monitoring of the neonatal units by the Provincial Department of Health, adequate material and human resources with neonatal specialisation and adherence to neonatal protocols.

9.3.2 Quantitative phase

The objective of the quantitative phase was to assess the factors influencing care for the sick neonates in the NICUs of public hospitals, Limpopo Province.

The findings of this study revealed that the majority of the respondents were females because nursing and midwifery is female dominant. The study found that most of the respondents were experienced registered midwives followed by newly qualified registered midwives. In addition, the findings show that the majority of the midwives completed a four-year comprehensive diploma course followed by one year diploma course and a lesser number of midwives completed a four-year comprehensive degree course. Very few nurses obtained neonatal intensive care training which is needed in the management of sick and small neonates admitted in NICUs. Most of the respondents had longer than 5 years working experience in NICUs. Moreover, the findings revealed that none of the individual midwives were trained in all the four skills, few were trained in two (2) skills, some were trained in only one (1) skill.

The findings revealed that neonatal sepsis/infection, prematurity/low birth weight, respiratory distress syndrome, gastroschisis and other congenital anomalies were the leading causes of neonatal mortality at the selected public hospitals. Perinatal asphyxia, meconium aspiration syndrome, gastro-intestinal disease and delayed seeking of neonatal care are also contributory factors to neonatal mortality. The findings revealed that shortage of staff, work overload of staff, delayed transfer to specialised hospitals and overcrowding of patients are the leading factors to poor quality neonatal care. The majority of the midwives were competent in executing the neonatal care for small and sick infants in NICUs. Only few of them reported fair and poor performance in executing the neonatal care After quantitative data analysis, the findings were integrated using joint-display, most of the findings converged while few of the findings diverged.

9.3.3 Phase 2: Model development phase

The objective of this phase was to develop a model for midwives who care for the sick neonates in the NICUs of public hospitals, Limpopo Province.
The components of the structure of a model for midwives who care for sick neonates are as follows:

a) Context**:** The context represents the setting where the activity takes place. The specific context in this study was the NICUs in the public hospitals of the Limpopo Province providing Level II and Level III neonatal intensive care to the small and sick neonates

b) Agents: The agent refers to the person that performs the activity. In this study, the primary agents are Midwives allocated in the NICUs of Limpopo Province regional and tertiary hospitals, who will be responsible for the facilitation of the model for midwives who care for sick neonates.

c) Recipient: The recipient refers to the person to whom the agent performs an activity. The recipients are sick neonates in NICUs of public hospitals in Limpopo Province. Therefore, the recipient needs to be empowered in order to provide high quality neonatal care to the small and sick neonates

d) Dynamics: The dynamics refer to the internal motivations of the agent and the recipient that have an influence on reaching the expected outcomes of the agent. In this study, dynamics are inadequate NICU infrastructure, lack of equipment, shortage of human and material resources, staff work overload, lack of neonatal protocols and lack of NICU speciality training.

e) Procedure**:** The procedure refers to the process of the activity performed by the agent. Midwives and neonatal intensive care trained nurses providing quality neonatal care to sick and small neonates in NICU. In this study, procedure involves the professional regulations and protocols and guidelines which is the second phase of the developed model.

f) Terminus: The terminus refers to the outcome of the procedure performed by the agent to the recipient, which is provision of quality neonatal care.

9.3.4 Phase 3: Model validation phase

The objective of this phase was to validate a model for midwives who care for sick neonates in the NICUs of public hospitals, Limpopo Province by maternal-newborn health care experts and model development experts. The following aspects were included in the model validation namely. How clear is the model? How simple is the model? How general is the model? How accessible is the model? How important is the model?

- *Results of model validation*

The findings of the model validation revealed that n=10 (63%) experts agreed that the model for midwives who care for sick neonates is clear. A total of n=6 (37%) of the experts indicated that the concept of agent and recipient were not clear. Furthermore, major concepts such as quality neonatal care, small and sick neonates as well as their interrelationship, were used as a guide to health care practice (Chinn and Kramer, 2008). All 16 (100%) experts agreed that the model for midwives who care for sick neonates was simple to follow. The schematic presentation is easy to follow and explained in detail and their relatedness is highlighted in the description of the model.

A total of n= 8 (50%) experts agreed that the model for midwives who care for sick neonates is general and can be applied to a broad array of situations. The same number of participants, n=8 (50%), suggested that model should focus on midwives and nurses working in NICU to be applicable to in different health care settings. All n=16 (100%) experts agreed that the model is important to neonatal health care practice, nursing education and also to the researchers. The model was refined according to the comments of the experts.

9.4 Limitations of the study

The national state of disaster and the lockdown, due to the pandemic Covid-19, negatively affected the progress of the study. The study was limited to the Limpopo Province, therefore the findings cannot be generalised to other provinces. The study setting was limited to the NICUs of the public hospitals hence the findings cannot be generalised to district hospitals special care nurseries and the NICUs of the private hospitals. Small population size due to shortage of staff in the NICUs in Limpopo Province.

9.5 Recommendations of the study

The study presents a model for midwives who care for small and sick neonates in NICUs. It is recommended that a model be studied and implemented on trial to establish whether it can positively modify the quality of neonatal care.

The following recommendations were made:

The recommendations were developed based on the findings to ensure that a model for midwives who care for sick neonates in NICUs is utilised to provide quality neonatal care as desired.

9.5.1 Recommendations for further research

The analysis and integration of the findings revealed that NICUs in the public hospitals are struggling to provide neonatal health care services of good quality. The gaps that impede the health system from providing quality health care were identified. One of the identified gaps is the shortage of midwives and lack of neonatal intensive care trained nurses, hence further research should focus on the skills audit to review the ability for quality neonatal health care service delivery. Shortages of material resources such as medical equipment and supplies were also identified and therefore procurement staff should be monitored.

9.5.2 Recommendations to practice

A model for midwives who care for sick neonates in NICUs should be implemented in a public hospital providing neonatal intensive care services. The Nursing Service Manager should hire more staff in order to reduce the workload of the midwives allocated in NICUs and neonatal intensive care trained nurses. The neonatal NICUs should be renovated to create more space and that will assist in reduction of overcrowding of neonates. The Nursing Service Manager should grant training opportunities for the midwives without a speciality, who are allocated in neonatal intensive care or basic neonatal care. Short courses and in-service training such as Helping Babies Breathe, Neonatal Resuscitation, Management of Sick and Small Newborns (MSSN) and Limpopo Initiative for Newborn Care (LINC) should be strengthened.

9.6 Conclusion of the phases

This chapter conclude the research study purported to develop and validate a model for midwives who care for sick neonates in NICUs. The study was conducted to develop a model for midwives who care for sick neonates in NICU to improve the quality of neonatal health care services. The findings disclosed that there were different challenges that affected the provision of quality neonatal care in NICUs. The model for midwives who care for sick neonates in NICUs was therefore developed to reduce such challenges. The guidelines on utilisation of a model was discussed in chapter 6. Shortage of human resource and material resources were identified as the main challenges in all five study settings. The study also identified a need for neonatal intensive care training for midwives who provide care to sick and small neonates. The research questions were answered and a model for midwives who care for sick neonates in NICUs was developed. This will result in benefits to small and sick neonates to receive quality neonatal care. Finally, the current model could serve as a reference point for care at neonatal care practice level.

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APPENDICES

Appendix I: Interview Guide

Gender:

M	F

Age:

25-29	
30-35	
36-40	
41-45	
46-50	
51 and above	

Speciality:

Experience in NICU

1. Greet the participant
2. Introduce self to the participant
3. Welcome the participant to the session
4. Point out the research purpose to the participant
5. Obtain verbal consent
6. Indicate what is expected of the participant
7. Indicate the role of the researcher

Central Question: "Could you please tell me about the challenges you encountered when rendering neonatal health care services to sick neonates in your unit?

Probing Questions:

1. "Could you please tell me about the challenges you encountered when rendering neonatal health care services to sick neonates in your unit?
2. Could you please tell me more?
3. Tell me about the infrastructure.
4. Explain to me the availability of equipment and material resources.
5. Tell me about the staffing.
6. What is the impact of the quality of neonatal care on neonatal mortality in your unit?
7. What do you think can be done to improve the quality of neonatal care?
8. Is there anything else that you would like to tell me?

Appendix II: Questionnaire

Title: Development and validation of a model for midwives who care for sick neonates in Neonatal intensive care units of public hospitals, Limpopo province

Instruction:

1. Please answer all the questions by making a cross (X) in the box corresponding to the chosen option.
2. Please answer all the questions as honestly and objectively as possible.

Section A: Socio-demographic data

Please make a cross (x) and fill in the applicable answer

1. **What is your age?**

21 – 25	**1**
26 – 30	2
31 – 35	3
36 - 40	4
41 – 45	5
46 – 50	6
51 and <	7

2. **What is your gender?**

Male	1
Female	2

3. **What is your rank?**

Operational manager	1
Experienced registered midwife/accoucheur	2
Newly qualified registered midwife/ accoucheur	3
Neonatal intensive care trained nurse	4

4. **Which educational program did you complete to become a midwife/accoucheurs?**

One year Diploma Course	1

Four-year Comprehensive Diploma Course	2
Four-year Comprehensive Degree Course	3

5. **What is your period of experience in neonatal intensive care units?**

6 months	1
1-5 years	2
6-10 years	3
11-15 years	4
16 -20 years	5
21 -25 years	6
26 and above	7

6. **Please indicate the hospital you are working at presently**

Mankweng Hospital	1
Mokopane Hospital	2
Tshilidzini Hospital	3
Letaba Hospital	4
St Ritas Hospital	5
Dilokong Hospital	6

Section B: Factors influencing the quality of neonatal interventions for the sick neonates

B1: Neonatal resuscitation

7. **Indicate your training in neonatal resuscitation (indicate all that apply)**

	Training Received (YES/NO)		**If yes, provide the date**	
	Yes	**No**	**Month**	**Year**
Helping Babies Breathe (HBB)	1	2		
Neonatal Resuscitation	1	2		
Management of sick and small Newborns (MSSN)	1	2		
Limpopo Initiative for Newborn Care (LINC)	1	2		

B2: Main causes of neonatal mortality

How prevalent are the following causes for babies to die in your institution?

0 = Never (N), 1 = Hardly ever (HE), 2= Sometimes (S), 3= Often (O), 4= Always (A)

		N	HE	S	O	A
8	Low birth weight/ Prematurity	0	1	2	3	4
9	Neonatal Pneumonia	0	1	2	3	4
10	Transient tachypnea of the newborn	0	1	2	3	4
11	Gastroschisis	0	1	2	3	4
12	Congenital anomalies	0	1	2	3	4
13	Perinatal asphyxia	0	1	2	3	4
14	Renal failure	0	1	2	3	4
15	Neonatal sepsis	0	1	2	3	4
16	Other infections	0	1	2	3	4
17	Gastro-intestinal diseases, e.g., Necrotizing Enterocolitis	0	1	2	3	4
18	Cardiac diseases of the baby	0	1	2	3	4
19	Metabolic conditions e.g. hypoglycaemia of the baby	0	1	2	3	4
20	Hypothermia of the baby	0	1	2	3	4
21	Respiratory distress syndrome	0	1	2	3	4
22	Persistent pulmonary hypertension of the newborn	0	1	2	3	4
23	Meconium aspiration syndrome	0	1	2	3	4
24	Delayed seeking of neonatal care	0	1	2	3	4

B3: Factors that lead to poor neonatal quality care

0 = Never, 1 = Hardly ever, 2= Sometimes, 3= Often, 4= Always

		N	HE	S	O	A
25	Work overload of staff	0	1	2	3	4
26	Shortage of staff	0	1	2	3	4
27	Lack of medication	0	1	2	3	4
28	Lack of equipment and supplies	0	1	2	3	4
29	Delayed transfer to specialised hospital	0	1	2	3	4
30	Unskilled midwives	0	1	2	3	4
31	Inexperienced midwives	0	1	2	3	4

32	Poor infrastructure	0	1	2	3	4
33	Overcrowding of patients	0	1	2	3	4

B4: Neonatal interventions for sick and small infants

Please tick (√) applicable answer according to keys below:

1 = Excellent **(E);** 2 = Good **(G);** 3 = Fair **(F);** 4 = Poor **(P)**

Are you able to:		**E**	**G**	**F**	**P**
34	Perform a full physical examination of the neonate?	1	2	3	4
35	Plan, implement and evaluate care of the neonate?	1	2	3	4
36	Monitor blood glucose	1	2	3	4
37	Monitor body temperature	1	2	3	4
38	Administer intravenous treatment	1	2	3	4
39	Perform cord care aseptically	1	2	3	4
40	Administer oxygen through blender	1	2	3	4
41	Administer supplemental Oxygen per nasal prong	1	2	3	4
42	Set the CPAP and put the baby on	1	2	3	4
43	Set the Ventilator and put the baby on	1	2	3	4
44	Management of infant on ventilator	1	2	3	4
45	Help the mother put the baby in Kangaroo position	1	2	3	4
46	Perform basic neonatal resuscitation	1	2	3	4

Appendix III: Ethical Clearance

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING: 26 September 2022

PROJECT NUMBER: TREC/80/2019-Amended

PROJECT:

Title:	Development and Validation of a Model for Midwives Who Care for Sick Neonates in Neonatal Intensive Care Units of Public Hospitals, Limpopo Province.
Researcher:	MG Mathebula
Supervisor:	Prof MA Bopape
Co-Supervisor/s:	Dr TE Mutshatshi Prof TI Ramavhoya
School:	Health Care Sciences
Degree:	PhD in Nursing Science

PROF D MAPOSA
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:

i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.

ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.

iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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Appendix IV: Department of Health Approval

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Ref: LP_201903_012
Enquiries: Stander SS
Tel: 015 293 6650
Email: research.limpopo@gmail.com

MATHEBULA MG
University of Limpopo
Private Bag x 1106
Sovenga
0727

Greetings,

RE: DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE

Permission to conduct the above mentioned study is hereby granted.

1. Kindly be informed that:-
   - Research must be loaded on the NHRD site (http://nhrd.hst.org.za) by the researcher.
   - Further arrangement should be made with the targeted institutions, after consultation with the District Executive Manager.
   - In the course of your study there should be no action that disrupts the services, or incur any cost on the Department.
   - After completion of the study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
   - The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
   - The above approval is valid for a 1 year period.
   - If the proposal has been amended, a new approval should be sought from the Department of Health.
   - Kindly note, that the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated.

Head of Department

02/05/2019
Date

Private Bag X9302 Polokwane
Fidel Castro Ruz House. 18 College Street. Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.

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Appendix V: Letaba Hospital Approval

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Approved 01/10/19.

Letaba Regional Hospital
Private Bag X 1430
Letaba
0870

DEPARTMENT OF HEALTH
HUMAN RESOURCE DEVELOPMENT AND TRAINING
01 OCT 2019
LETABA REGIONAL HOSPITAL
P/ BAG X1430, LETABA 0870, MOPANI DISTRICT
LIMPOPO PROVINCE

Ref: S5/4/2/3
Enq: Malatji E.M
Date: 10/06/2019

ATT: **MATHEBULA MG**
University of Limpopo
Private bag x 1106
Sovenga
0727

RE: OFFER FOR APPLICATION TO CONDUCT RESEARCH STUDY FOR DEVELOPMENT AND VALIDATION OF MODEL FOR MIDWIVES WHO CARE SICK NEONATES IN NEONATAL INTENSSIVE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE

1. The above matter refers

2. It is a great pleasure to inform you that the Acting Chief Executive Officer has approved your application to conduct research study for development and validation of a model for midwives who care for sick neonates in neonatal intensive care unit of the public hospital. It has been approved for a period of a year as per our department`s approval. And you will be placed under Nursing Services Management.

Starting Time: 07h30
Lunch Time: 13h00 to 14h00
Knock off Time: 16h30

3. You will be expected to work from Monday to Friday.

4. NB.Please note that you will not get remuneration/ Compensation during your Research study.

Hoping that you will enjoy your stay in the hospital.

.... 11/06/2019
ACTING CHIEF EXECUTIVE OFFICER DATE

Private Bag X 1430, LETABA, 0870
Cnr. Tarentaal and Lydenburg Road, Tel: (015) 303 8200, Fax no: 015 303 8421

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Appendix VI: Mankweng Hospital Approval

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

MANKWENG HOSPITAL

Ref: S5/3/1/2

Enq: Ramoba LM

From: HR Utilization and Capacity Development

Date: 28 May 2019

TO : Mathebula MG
University of Limpopo
Sovenga Campus

RE:REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT MANKWENG HOSPITAL: DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE UNITS OF PUBLIC HOSPITALS: LIMPOPO PROVINCE

1. The above matter has reference.
2. This is to confirm that the Acting Chief Executive Officer has granted permission to conduct research **on "Development and Validation of a Model for Midwives who care for sick Neonates in Neonatal Intensive Units of Public Hospitals: Limpopo province".**
3. Research will be conducted for a period of one year from 01 June 2019 to 31 May 2020.
4. Attached please find the application letter,approval from Provincial Office, Research Proposal and University of Limpopo Research Ethics Committee Clearance Certificate.
5. Thanking you in advance.

MgMalepe
Acting Chief Executive Officer

2019/05/29
Date

Tsebe

NT.

Appendix VII: Department of Health Approval (renewed)

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref	:	LP_2021-08-005
Enquires	:	Ms PF Mahlokwane
Tel	:	015-293 6028
Email	:	Phoebe.Mahlokwane@dhsd.limpopo.gov.za

Mpho Gift mathebula

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

Development and validation of a model for midwives who care for sick neonates in neonatal intensive care units of public hospitals, Limpopo province

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
    a. Present this letter of permission to the institution supervisor/s a week before the study is conducted.
    b. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
    c. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
    d. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
    e. The approval is only valid for a 1-year period.
    f. If the proposal has been amended, a new approval should be sought from the Department of Health
    g. Kindly note that, the Department can withdraw the approval at any time.

    Your cooperation will be highly appreciated

PP **Head of Department** 13/09/2021 **Date**

Private Bag X9302 Polokwane
Fidel Castro Ruz House, 18 College Street. Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.
Website: http/www.limpopo.gov.za

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Appendix VIII: Mankweng Hospital Approval (renewed)

DEPARTMENT OF HEALTH
CHIEF EXECUTIVE OFFICER
2021 -09- 23
PRIVATE BAG X 1117 SOVENGA 0727
LIMPOPO PROVINCE

Restricted

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH
MANKWENG HOSPITAL

Ref: S5/3/1/2
Enq: Modula MC
Ext: 1042
Email: motlatso.modula@dhsd.limpopo.gov.za

To: Ms. Mathebula MG
m.giftmathebula@gmail.com
082 266 5909

REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT MANKWENG HOSPITAL: DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE CARE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE.

1. The above matter has reference.
2. This is to confirm that the acting CEO has granted you a permission to conduct research on "development and validation of a model for midwives who care for sick neonates in Neonatal Intensive Care Units of Public Hospitals, Limpopo Province".
3. The permission to conduct the research will be for a period of 1 year as stipulated on the approval letter from the Provincial Head Office.
4. Attached please find her application letter, ethics clearance certificate and approval letter by the Provincial Office.

Yours in service delivery

Acting Chief Executive Officer
Dr. Muila SL

27/05/2021
Date

Private Bag X1117, SOVENGA, 0727 Tel: 015 286 1000 Fax: 015 267 0206
Houtbos Road, Sovenga
Restricted
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Appendix IX: Letaba Hospital Approval (renewed)

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH
LETABA REGIONAL HOSPITAL

Ref : S4/3/5

Enq : Malatji EM

Tel : 015 303 8226

Email : Eleck.malatji@dhsd.limpopo.gov.za

To : Acting Chief Executive Officer (Ms. Ragolane VJ)

From : HRM Deputy Director: Corporate Services (Nkolele TT)

ATT: Ms Mathebula Mpho Gift
Private Bag x 1106
SOVENGA
0727

RE: OFFER TO CONDUCT RESEARCH IN THE DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE.

The above matter refers

It is a great pleasure to inform you that the Chief Executive Officer has approved your application for Research. It has been approved with effect for a period of 1 year.

Starting Time: 07h30
Lunch Time: 13h00 to 14h00
Knock off Time: 16h30

You will be expected to work from Monday to Friday.

NB. Please note that you will not get remuneration/ Compensation during your job training.

Hoping that you will enjoy your stay in the hospital.

Acting Chief Executive Officer
Ms Ragolane VJ

18/10/2021
Date

Private Bag X 1430, LETABA, 0870
Cnr. Tarentaal and Lydenburg Road, Tel: (015) 303 8200, Fax no: 015 303 8421

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Appendix X: Waterberg District Approval

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH
WATERBERG DISTRICT

REF: 4/3/3.
ENQ: NKGODI D.R (PA TO THE DISTRICT EXECUTIVE MANAGER)

TEL NO: 014. 718 0623 / 082 344 0227.
E-MAIL: David.Nkgodi@dhsd.limpopo.gov.za

TO: MATHEBULA M.G

RE: PERMISSION TO CONDUCT RESEARCH: YOURSELF.

The above bear's reference: -

1. The office of the District Executive Manager, hereby confirms receipt of your request to conduct research on development and validation of a model for midwives who care for sick neonates in neonatal intensive care units of public hospitals in Limpopo Province.
2. Permission is hereby granted as per approval by the HOD.
3. You are further requested to notify this office on when you are going to start with the research and make sure that there is no action that disturbs service delivery.

Your support and cooperation in terms of the above will be highly appreciated.

BULANNGA N.G.
DISTRICT EXECUTIVE MANAGER

27|09|2021
DATE

Waterberg District Office Private Bag X 1026 Modimolle,
0510 Tel (014) 718 0600 Fax (014) 718 0675

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Appendix XI: Mokopane Hospital Approval

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF
HEALTH

NURSING SERVICES

Enquiries : Ms. Manaka J.M

Contact Number: 015 483 4174

Email address : Raisibe.Nyatlo@dhsd.limpopo.gov.za

Date : 19th October 2021

Attention: Ms. Mathebula M.G
University of Limpopo
P/Bag X 1106
SOVENGA
0727

RE: PERMISSION TO CONDUCT RESEARCH STUDY: YOURSELF

GREETINGS

The above matter bears reference:

1. The office of the Hospital Nursing Management and CEO has acknowledged your request to conduct a research study titled: **Develop and validate a model for midwives who care for sick neonates in neonatal intensive care units of public hospitals, Limpopo province.**
2. We therefore grant you the permission.

Yours in service delivery.

Dr. Mokumo D.S
Acting Chief Executive Officer

DEPARTMENT OF HEALTH
MOKOPANE HOSPITAL
CEO'S OFFICE
19 OCT 2021
Date
LIMPOPO PROVINCE

Mokopane Regional Hospital Private Bag X2466 Mokopane, 0600 Tel (015) 483 4000 Fax (015) 483 2405

Appendix XII: Tshilidzini Hospital Approval

Restricted

LIMPOPO

PROVINCIAL GOVERNMENT

REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

TSHILIDZINIHOSPITAL

Ref: 8/1/1

Enquiries: Netshifhefhe L.E

Date: 27 October 2021

To: Mpho Gift Mathebula

Subject: Permission to conduct research on development and validation of a model for Midwives who care for sick neonates in Neonatal Intensive care Units of Public Hospitals, Limpopo Province.

1. The above matter refers.
2. Your letter received on the 19 October 2021 requesting for permission to conduct a research is hereby acknowledged.
3. Permission is therefore granted for the study to be conducted at Tshilidzini Hospital.

Wishing you success in your endeavour.

PP CHIEF EXECUTIVE OFFICER

2021/10/27

DATE

Private Bag x 924 SHAYANDIMA 0945

Tel : (015) 964 4200 Fax : (015) 964 1492

(015) 964 1072

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Appendix XIII: Sekhukhune District Approval (St Ritas hospital)

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH
SEKHUKHUNE DISTRICT

Ref : S2/2/3
Enq : MOGANO K.N.M
Tel : 015 633 2412/ 076 399 8428
Date : 18 October 2021
Email: Norman.Mogano@dhsd.limpopo.gov.za

Mpho Gift Mathebula

<u>DEVELOPMENT AND VAILDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE CARE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE</u>

Background

The above student is furthering studies with University of Limpopo for PhD in Nursing Sciences, student number: 200205284
Her research topic is DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE CARE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE. It's a quantitative research which does not need access of any clinical records by the student. (It is a Questionnaire interview method with subjects of study)

The Provincial department of health HOD has granted her permission to conduct this research and to observe and adhere to all principles of research

Motivation

The district HRD request that permission be further granted to Mpho Gift Mathebula to conduct this research at St Rita's Hospital, as already been granted this permission by the provincial office as outlined on the attached letter.

Approved /~~not approved~~

.... 2021.10.22..........
ACTING DISTRICT EXECUTIVE MANAGER **Date**

Private Bag X04, Chuenespoort 0745
Tel: (015) 633 2300, Fax: (015) 633 7927
Website: <u>http://www.limpopo.gov.za</u>

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Appendix XIV: Consent form

University of Limpopo: English consent form

Statement concerning participation in a Research Project

Name of Study: **Development and validation of a model for midwives who care for sick neonates in Neonatal intensive care units of public hospitals, Limpopo Province.**

I have heard the aims and objectives of the proposed study and was provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.

I know that sound recordings scientific publications which will be electronically available throughout the world. I consent to this provided that my name is not revealed. I understand that participation in this Study is completely voluntary and that I may withdraw from it at any time and without supplying reasons.

I know that this Trial / Study / Project have been approved by the Turfloop Research and Ethics Committee (TREC), University of Limpopo (Turfloop Campus) and Limpopo Department of Health. I am fully aware that the results of this study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this Study.

....	....
Name of the volunteer	Signature of volunteer
…………………………..	……………………………
Place	Date
……………………………	……………………………..
Name of the researcher	Signature of the researcher
…………………………………	………………………………..
Place	Date

Statement by the Researcher

I provided verbal and/or written information regarding this study.

I agree to answer any future questions concerning the study as best as I am able.

Appendix XV: Letter of Independent Coder

CODING REPORT

FOR : **Ms. MG Mathebula**

DATE : **2022 / 01/19**

TITLE : **Development and Validation of a model for midwives who care for sick neonates in Neonatal Intensive Care Units of public hospitals, Limpopo province.**

INDEPENDENT CODING BY Dr GO Sumbane

THEMES AND SUBTHEMES

SUMMARY OF OBSERVATIONS MADE DURING ANALYSIS OF DATA

The following observations were made:

- Data saturation was reached with all themes and sub-themes. Saturation is based on the verbatim excerpts from the transcriptions and voice recordings provided because all themes have four and more sub-themes.

DATA ANALYSIS PROCESS

The data collected were analyzed using 8 steps of Tesch's open coding qualitative data analysis method as described by Creswell (2014). A consensus meeting was set between the researcher and the independent coder in order to discuss and agree on final themes and sub-themes based on the ones which emerged when analyzing independently.

Appendix XVI: Letter of Statistician

LIMINAL

RESEARCH CONSULT

15 Aug 2022

Letter of Statistician

RE Statistical analysis of the dissertation: "*DEVELOPMENT AND VALIDATION OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NEONATAL INTENSIVE CARE UNITS OF PUBLIC HOSPITALS, LIMPOPO PROVINCE*"

TO WHOM IT MAY CONCERN

This letter serves to confirm that HJ Gerber guided MS MPHO GIFT MATHEBULA for **one hour** to do analyses in the statistical package SPSS for her empirical research efforts for her Doctor of Philosophy study at the Department Health Sciences of the University of Limpopo.

Although every effort was made to ensure that the student presented the statistical results correctly, HJ Gerber cannot accept responsibility for the structure and presentation of the results of this study. Kindly contact me should you need to verify the contents of this letter, should it be required.

Hennie Gerber
Statistician
hennie.gerber@liminalrc.co.za
083 229 9993

....

MONIQUE KOCK
RESEARCH CONSULTANT
monique.kock@liminalrc.co.za
082 926 1288
www.liminalrc.co.za

HENNIE GERBER
RESEARCH CONSULTANT
hennie.gerber@liminalrc.co.za
083 229 9993
www.liminalrc.co.za

Appendix XVII: Editing/proofreading Certificate

EDITING / PROOFREADING CERTIFICATE

Editor details

DR NELLIE NARANJEE
Doctorate Nursing, MBA, MCur .
Freelance academic editor: Blackford Institute, UK

Contact details
Mobile : 0825776126
Email : naranjeen@gmail.com

Author : Ms Mpho Gift Mathebula

Thesis : Doctor of Philosophy - Nursing Science : Development and Validation of a Model for Midwives who Care for Sick Neonates in Neonatal Intensive Care Unit of Public Hospitals, Limpopo Province

Student number : 200205284

This is to certify that the above manuscript has been proofread and edited for English language grammar, punctuation, spelling, writing style, clarity, sentence structure and layout. The document is formatted according to the institutions requirements and guidelines. The logical presentation of ideas and the structure of the paper were also checked during the editing process. Neither the research content nor the author's intentions were altered in any way during the editing process.

I am a freelance editor specialising in proofreading and editing academic documents. All amendments were tracked with the Microsoft Word " Track Changes " feature and the document was returned to the author.The author has the option of accepting or rejecting each change individually. The author remains responsible for the correct application of the changes in the text and references. I wish the author all the best.

DR NELLIE NARANJEE	29 November 2022 DATE

Appendix XVIII: Transcript 1

Introduction: *My name is Mpho. I am doing research towards doctoral degree at the University of Limpopo. You don't have to say your name, surname and the name of the hospital to ensure anonymity and confidentiality of the data I am going to collect. I would like to welcome you to this session. The purpose of my study is to 'develop and validate a model for midwives who care for sick neonates in neonatal ICUs at the public hospitals in Limpopo Province of which this is one of them. Please note that no names of the individuals or NICUs will be used during the research even when I will be writing the report to ensure anonymity instead codes will be used. I will be expecting you to respond to the questions that I be asking you. Please be free and give the information being free or in-depth. I am going to record this session with this small recorder and the collected information is not going to be used against you nor the institution, it's just for data analysis and after that it will be destroyed. I am having a note book to capture the non-verbal cues since the recorder cannot capture them, don't be surprised. I would like to interview you please. I want to know if you give consent to participate in this study. You may sign consent form to indicate that you agree to participate in this study. Please note that you have the right to withdraw from this study at any time, you will not be punished for that.*

Researcher: *Could you please tell me about the neonatal care you are rendering to sick neonates in your unit?*

Participant: *Basically, in our unit everyone as a professional nurse when we arrive here we check that the baby is not cold is warm, covered warmly, the drip is not in and not tissued because if it is tissued when we go and check the blood glucose at a later stage you will find that it is low and there comes a problem. We call the doctor to come and re-insert the IV line. You check if the baby is comfortable, more especially those who are on ventilators and DuoPAP machine to see if they are breathing well before we do anything in the unit that is the only thing that we prioritize in the early hours of the morning. Then we also check that the baby is well taken care of by checking the abdominal, you find that at 6am they feed their babies, sometimes you find the baby has just slept have vomited that food and they are out, and the other 2 professional nurses have already knocked off that is the first thing that we check even when the abdomen is not distended. We first call the doctors to reassess the neonates. After that we do our vital checking to make sure that the baby is saturating well the pulse rate is ranging within the normal limit even the HGT. The HGT we take 3 hourlies more* *especially on babies who are on nil per os, babies who are not fed ordered by the doctor maybe for that moment. We must keep them on nil per os, nothing to be given orally except for the maintenance of the IV line. After that it will be followed by the doctors for their normal routine to come and do the ward rounds. If is not an emergency, we are able to manage it either by… I can give an example of, if blood glucose is low we put up a drip, then we regulate it then we notify the doctor telephonically. When he arrives, he found that we have done the main nursing measures so as to help the neonate to live.*

Researcher: *Is there something that you would like to add regarding the care?*

Participant: *Regarding the care is just that this area is too hectic. Ijhoo very- very it needs one to be patient and passionate.*

Researcher: *What are the challenges that you encounter when rendering the care to sick neonates in your unit?*

Participant: *That's the most challenging but with the help from each other we normally improvise to help each other. We don't omit a thing kahle-kahle nje but if I need help, I can shout for another sister to come and assist because that side we are working being 4 If one is sick is a problem, if one is having a problem we left with 2. Is either you call one for moonlighting and is not… so we normally help each other for that matter.*

Researcher: *Besides the issue of being hectic in this area, what are the other challenges that you are facing?*

Participant: *The other challenge that we are facing in our unit more especially… sometimes we experience … our equipment some are broken not working but they try their level best to check every now and then maybe to call those who have brought the machines to come and fix it and to come service it. But sometimes you find that kids are so many that side that they need to be ventilated and you find that we have got shortage of ventilators at times because we accommodate only 8 in that area. Sometimes we put another extra 2 beds to make it 10. And that 10 need how many sisters? It needs 5 nurses 2 per ratio. But if we are short staffed you have to take 4 and 4 in a neonate… the one who doesn't speak, you will just go and check the napkin, he won't say mama I am hungry, you just have to think everything for them. So, with 4 neonates really you just have to pull up your energy and strength because 4 shame really is not… it too much but we try, we manage. We try shame with the assistance of our doctors they are always here at all times more especially during the day there is no problem,* *we don't shoot them shame they are always available even at night when there is a problem if you first come in… I knocked at 19h00 yesterday neeh, I left that doctor who was on call for the night I arrived here today 06h15 she was still here because it was hectic. Uh she didn't even go out of the unit up until we relieve her this morning. Is too much, we love our job, I even went to an extent that one year in 2019 they took me to Kempton Park for a course ya cancer of a neonate. I did for 10 days so that when we come across such thing, we refer to Polokwane hospital at an early stage*

***Researcher:** Okay, you have already touched on the issue of the infrastructure. What more can you say with the infrastructure?*

***Participant:** The space is not enough because they were saying…our paeds doctor the head of the department said they will renovate that side to make it a smallernyana ICU. I think they will do that because now they are busy with renovating paediatric-neonatal and intensive care unit. I think when they are done, they will come this side. That side when it's too hectic is too small and we don't … 10 becomes too much at least 8 is manageable.*

***Researcher:** You said something about the staffing. Is there something that you would like to add?*

***Participant:** On the staff we do have shortage of staff really shame cause on daily basis we are 4 registered nurses from Wednesday to Wednesday even the other group they are 4 so far it is not enough. Four per 8 beds more especially in ICU is not, it should be 1:1 unlike we used to work outside Limpopo, 1:1 normally. Even if they don't train people for ICU but those that have experience and are interested to come and assist in neonatal, they need to be in-serviced, is just a matter of a day just to orientate people and we are on the way of living.*

***Researcher:** So how is the mortality in the unit?*

***Participant:** Mortality, it depends on the months actually. Is not as bad as such sometimes you find that the whole month, we have got maybe 2 deaths, three it varies with the months. If we do experience the prematurity birth some they survive up until a month that side until they come at the unit that's why I am saying it goes with months. It is not that high you find that the whole month we laugh and dance because we didn't experience any death. Because some other months Ijhoo we even cry…you find that day staff lost a baby a night nurse lost a baby, it is demoralizing.*

***Researcher:** But you won't relate the staffing, equipment and the infrastructure to mortality?*

Participant: *They are trying their level best, the equipment that we need to use is at hand.*

Researcher: *So, what do you think can be done to improve the care that you are rendering to neonates?*

Participant: *Mina according to me in this unit of us, I think if they can add more area and add staff to prevent shortage because you cannot predict illness, you cannot predict problems. But if on daily basis we are more, I think it can really work because like you find that on other circumstances the other sister is attending a BI, the ups and downs of the counselling and obviously what about the other patient that side? The next person will have to take another 2 of them but we try shame-we try we even omit our teatime and lunch. Did you see what time we went now I was worried that our visitor has no one to attend. Eh siyaboya but we cannot compare our public hospital to our private hospital. No, we cannot is just to try our level best.*

Researcher: *Is there any other relevant information that you would like me to know?*

Participant: *A lot of things we do shame. Normally in neonatal that side we don't improvise a lot we have what we need to use. What we are worried about, sometimes our doctors are being exhausted because they are also being short staffed, but you will find that doctor will be here with you until… from morning until sunset at 119h00 and the one who is going to take a call will come in till the following morning. Like when they take a call, they are being allocated being one with an intern then anything impossible they just call a consultant to come with an information, do-this-do-this-do this, then we assist the newborn. And this area a lot of people do not like it, it is so busy. Before I came to work here, I thought aah they are not doing a thing, Ijhoo! Up until I came in yaah, I could feel that when you say "vashumi" (workers) indeed you are from work. Even that thing of saying today I am sick, even when you are tired, tomorrow you wake-up and come, you are thinking for others, if I don't come they will be left with 3 you see. You just come, you rather take panado and the days goes on.*

Researcher: *Thank you very much for your participation.*

Participant: *Thank you too.*

Appendix XIX: Transcript 2

Introduction: *My name is Mpho. I am doing research towards doctoral degree at the University of Limpopo. You don't have to say your name, surname and the name of the hospital to ensure anonymity and confidentiality of the data I am going to collect. I would like to welcome you to this session. The purpose of my study is to 'develop and validate a model for midwives who care for sick neonates in neonatal ICUs at the public hospitals in Limpopo Province of which this is one of them. Please note that no names of the individuals or NICUs will be used during the research even when I will be writing the report to ensure anonymity instead codes will be used. I will be expecting you to respond to the questions that I be asking you. Please be free and give the information being free or in-depth. I am going to record this session with this small recorder and the collected information is not going to be used against you nor the institution, it's just for data analysis and after that it will be destroyed. I am having a note book to capture the non-verbal cues since the recorder cannot capture them, don't be surprised. I would like to interview you please. I want to know if you give consent to participate in this study. You may sign consent form to indicate that you agree to participate in this study. Please note that you have the right to withdraw from this study at any time, you will not be punished for that.*

Researcher: *Could you please tell me about the neonatal care you are rendering to sick neonates in your unit?*

Participant: *We receive the files from the night stuff, from there we do, no, I am sorry. First thing in the morning when we enter the unit you do wash your hands and dry it then we took report from the night staff. After that we come for praying but someone have to remain there because you cannot leave the babies alone. Then we do the praying, after praying we receive the files, after that we clean the incubators, we change the linen and then after that is a routine time of doing vital signs wherever there is an abnormality we record. Then after that the doctors came to the ward rounds, we note the orders ordered by the doctor, then we implement what we are supposed to do. Then while checking any change we observe the babies, then during maybe giving of medication we give medication, if there is any change or maybe there is a problem the mother wants to know we have to assist.*

Researcher: *What vital signs are you doing to the neonates?*

Participant: *We do temperature, respiration, heart rate, Hgt and then saturation. We use the monitors to monitor them.*

Researcher: *So how often do you monitor them?*

Participant: *Three (3) hourly: 09h00, 12h00,15h00 and 18h00 and continue night from 21h00, 00h00, 03h00 and 06h00 in the morning.*

Researcher: *What are the challenges that you encounter when you are rendering neonatal care to the sick neonates in Neonatal Intensive Care Unit?*

Participant: *The challenges are a lot; the challenges are a lot. Sometimes we have a shortage of equipment, sometimes some of the equipment are malfunctioning, not working properly like sometimes you find that we want to put the baby in an incubator, you find that, that incubator is not warm and also the linen is not enough for us. Sometimes even the hand towels for drying our hands, but the soap is always available.*

Researcher: *What equipment are you running short off? You mentioned the incubator, is it the only one that you are running shot of?*

Participant: *No, it is not the only one, I just mean that… it was an example some like the servos are not working, we use the head servos which means that we are supposed to be having the servos. All the servos I think is only 3 out of 8 which are working, is only 3 currently are working the rest are not working. And even the monitors, sometimes we are not having enough, we have to borrow from one baby to another, but we sanitise our hands before handling and after handling we sanitise and go to the next baby.*

Researcher: *You said that the challenges are many, are a lot so you mentioned equipment and material resources…*

Participant: *And the shortage of staff, like now in the afternoon there will be two (2) nurses only because here is eight (8) bedded room. Those two (2) nurses must make sure that they work this unit, these 2 units: N1 (nursery 1) and N2 (nursery 2) and also Kangaroo Mother Care (KMC), so shortage of staff is a problem, a very big one, a very big one.*

Researcher: *What is the other challenge you said they are many?*

Participant: *Even the doctors they are not enough, sometimes, like insertion of a drip is not our scope but sometimes we do try to assist if you see that the baby is in a critical condition, so you have to assist.*

Researcher: *What about the infrastructure in the NICU?*

Participant: *The space is small as well, because I said our unit was supposed to be eight (8) bedded unit. Sometimes you find that we have more than 8, we have 11 because of the intake of the patients. So, and when they are many the staff is very small, the movements is limited because the thing of 11 or 10 instead of 8 there must be a monitor, there must be suction so that when the mothers are coming to feed their babies the space is very small. Like now during this period of corona the distance is not 1.5 m there will be a spread of infection.*

Researcher: *What is the impact of the challenges you have mentioned to the quality of neonatal care and mortality?*

Participant: *They do sometimes.*

Researcher: *Can you explain more?*

Participant: *They do because they say babies die because of infections. As I said that if the space is small, there will be transmission of infections.*

Researcher: *What do you think can be done to minimise these challenges and also to improve the quality of the neonatal care you are providing to the sick neonates?*

Participant: *Huh! That one it will be difficult. I won't say that what can be done because some is financial.*

Researcher: *Yes, you can also mention it even if it is financial. That is what you are thinking it can bring some improvements.*

Participant: *The improvements can be done. You know we are taking patients from other hospitals and even our hospital is also admitting. Like for instance, they admit the mother from Giyani, Nkhensani hospital when she delivered you find that the baby is not okay and comes to our unit and on the other hand paeds doctor also accept babies from other hospitals. So, the intake is a problem and we won't refuse patients or return the patients. Even the clinics sometimes they do deliver the patients there, you find that the baby is not okay, they transfer straight to our unit. So, I don't know how this can be solved, really is difficult.*

Researcher: *Is it difficult for you or for those who should intervene?*

Participant: *Because is long that we are complaining.*

Researcher: *But you can tell me since I am going to develop a model.*

Participant: *Like for instance, now we are not having a refrigerator for the medication. It has been a long time requesting they said they don't have money to buy the refrigerator. So, you see that… that's why I am saying most of the challenges are not resolved. So, it is great challenge when it comes to that.*

Researcher: *Is there any other relevant information that you will like me to know?*

Participant: *No*

Researcher: *I would like to thank you very much for participating in this study. Have a blessed day further*

Participant: *Be blessed on your study.*

Appendix XIV: Model Validation Questionnaire

SECTION A

Position : ____________
Speciality : ____________

Instructions:

1. Please do not write your name, name of institution on this questionnaire for anonymity
2. Please feel free to give comments or inputs.
3. Please indicate your response to the question below by making a tick (√) :

   Yes = 1   No = 2

SECTION B

1. CLARITY OF THE STRUCTURE OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NICUs

No	Criteria	Yes	No	Remarks
	Sematic clarity and consistency			
1.1	Is the concept of “Agents” clear in a model?	1	2	
1.2	Is the concept of “Recipients” clear in a model?	1	2	
1.3	Is the concept of “Dynamics” clear in a model?	1	2	
1.4	Is the concept of “Procedure” clear in a model?	1	2	
1.5	Is the concept of “Terminus/outcome” clear a model?			
1.6	Are definitions consistent with one another?	1	2	
1.7	Are assumptions and purposes compatible with other elements in the model	1	2	
	Structural clarity and consistency			
1.8	Is the context of a model for midwives who care for sick neonates in NICUs clearly described?	1	2	
1.9	Is the goal of a model for midwives who care for sick neonates in NICUs clearly set?	1	2	
1.9	Do all relationships fits within the structure of a model?	1	2	
1.10	Is the model graphically portrayed well in the form of a visual presentation?	1	2	
1.11	Do diagrams and structures provide support with one another	1	2	
1.12	Is there any interconnection between the concepts used in the model?	1	2	
1.13	Is there any evidence of logic coherence on the frame of reference of the model	1	2	

Please explain how clear the structure of a model for midwives who care for sick neonates in NICUs is?

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2. SIMPLICITY OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NICUs

No	Criteria	Yes	No	Remarks
2.1	Is the model for midwives who care for sick neonates in NICUs clear for easy reading?	1	2	
2.2	Is the model understandable?	1	2	
2.3	Are relationships directional	1	2	
2.4	Are relationships illustrated	1	2	
2.5	Are guidelines formulated for the operationalization of a model for midwives relevant	1	2	

Please describe the simplicity of a model for midwives who care for sick neonates in NICUs:

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3. GENERALITY AND IMPORTANCE OF A MODEL FOR MIDWIVES WHO CARE FOR SICK NEONATES IN NICUs

No	Criteria	Yes	No	Remarks
3.1	Is the model for midwives designed in broad implications to make it applicable in different disciplines?	1	2	
3.2	Does the model have the potential to influence neonatal health actions?	1	2	
3.3	Will application of a model for midwives in NICUs resolve neonatal care challenges	1	2	
3.4	Are the concepts within the domain of nursing	1	2	
3.5	Is a model for midwives in NICUs addressing the realities of the situation	1	2	
3.7	Is a model leading to the terminus of quality neonatal interventions?	1	2	

Comments:

Thank you for completing a model validation report