

**KNOWLEDGE AND PRACTICES OF MIDWIVES REGARDING THE
UTILIZATION OF CARDIOTOCOGRAPHY IN LABOUR UNITS AT
MOKOPANE AND VOORTREKKER HOSPITALS, WATERBERG
DISTRICT IN LIMPOPO PROVINCE.**

By

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DISSERTATION

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DECLARATION

I, **Ruth Raesetja Mazwi**, declare that the research reported in this thesis, **“Knowledge and practices of midwives regarding the utilization of cardiocography in labour units at Mokopane and Voortrekker hospitals, Waterberg district in Limpopo Province”** is my original work and that all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

This dissertation submitted to the University of Limpopo for the degree of Master of Nursing Sciences (M Nurs) has not been submitted for a degree at any other University or Institution; it is my own work in design and execution, and all material contained herein has been duly acknowledged.

.....

Signature

Mazwi, Ruth Raesetja

.....

Date

DEDICATION

This study is dedicated to my mother, Winnie Mokgaetji Mazwi, my grandmother, Anna Raisibe Mmatli, and my daughter, Omphile Linda Mazwi.

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I am grateful to the Almighty God for the wisdom that he granted me to complete this study.

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ABSTRACT

The aim of the study is to determine the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units, at Hospital A and Hospital B, Waterberg District in Limpopo Province. Further, the objective of the study is to explore and describe the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units and to develop strategies to enhance midwifery practices and knowledge regarding the utilization of cardiotocography in the labour units of Hospital A and Hospital B. The research question is:” What is the knowledge and practices of midwives regarding the utilization of cardiotocography in the labour units of Hospital A and Hospital B?” The Donabedian Model has been used as a theoretical framework.

A qualitative exploratory, descriptive and contextual research design has been used in this study. Purposive sampling was used to sample eighteen (18) participants from Hospital A and Hospital B. Data was collected using semi-structured interviews. Tesch’s eight steps of qualitative data analysis were followed and two themes and ten sub-themes emerged.

The study found that there were several challenges encountered by participants such as a shortage of material and human resources and lack of continuous training which has a negative impact on the provision of midwifery care. The study recommends that the Department of Health should appointment new skilled midwives as there is shortage of staff, to improve service delivery. It should ensure that there is a guaranteed supply and availability of equipment, such as CTG. The nursing administration should ensure that there is adequate training for midwives. This includes in-service training, workshops and a post basic advanced midwifery course.

Keywords: Knowledge, Practice, Utilization, CTG, Midwives.

DEFINITION OF CONCEPTS

Knowledge

Knowledge is information and skills acquired through experience or education (Inman & Robinson, 2016). In this study, the researcher seeks to gain insight into and understanding of the knowledge of midwives regarding the utilization of CTG in labour units, depending on their acquired experience when monitoring pregnant women during labour.

Practice

Practice is the actual application or use of an idea, belief or method, as opposed to theories related to it (Beckett & Horner 2015; Armes, Engelhart, McKenzie & Wiggers, 2015). In this study, practice refers to the way in which midwives at the Mokopane and Voortrekker hospitals use cardiotocography (CTG) when monitoring pregnant women during labour. They are expected to act according to set guidelines and protocols.

Midwife

Midwife is a licensed person who is registered with the South African Nursing Council (SANC), based on the completion of a recognised education and training programme, to nurture, assist and treat the client, who may be a woman, a neonate or a family, in the process of promoting a healthy pregnancy, labour and post-partum period (Act No.50 of 1978). In this study, the midwife is a person who is recognized by the SANC to practise as a midwife and to influence the course and management of pregnancy, all the stages of labour and the post-partum period.

Utilization

Utilization it is the action of making practical and effective use of something (Stufflebeam & Coryn, 2014). In this study, the effective use will be based on the cardiotocography monitor utilized by midwives during labour when monitoring the foetus in utero.

Cardiotocography (CTG)

Cardiotocography is a tool that is used to assess foetal well-being during labour and to identify the possibility of asphyxia (Devane, Lalor, Daly, McGuire & Smith, 2012). It is further described by Pettker & Campbell (2018) as the visual representation of the foetal heart rate and uterine contractions. In the current study, cardiotocography refers to the electronic equipment utilised by midwives to examine the foetus in utero during labour.

LIST OF ABBREVIATIONS

ANC	Antenatal Care
AIDS	Acquired Immune Deficiency Syndrome
CBD	Central Business District
CEO	Chief Executive Officer
CESDI	Confidential Enquiry into Stillbirths and Deaths in Infancy
CTG	Cardiotocography
DM	Diabetes Mellitus
DoH	Department of Health
DR C BRAVADO	DR Define Risk, C- Contractions, BRa- Baseline Rate, V- Variability, A- Accelerations, D –Decelerations, O - Overall impression
EFM	Electronic Foetal Heart Monitoring
FIGO	Federation of Gynecology and Obstetrics
FHR	Foetal Heart Rate
HIV	Human Immunodeficiency Virus
ICM	International Confederation of Midwives
KM	Kilometer
MSL	Meconium-Stained Liquor
NST	Non-Stress test
TREC	Turfloop Research Ethics Committee
SA	South Africa
SANC	South African Nursing Council
WHO	World Health Organization
UNICEF	United Nations International Children’s Emergency Fund

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CHAPTER 1

OVERVIEW OF THE STUDY

1.1 Introduction and background

According to the ICM (2014), midwives are the professionals with whom women have the most contact throughout their pregnancies. They are responsible and accountable professionals who work in partnership with pregnant women to render the necessary support, care and advice during pregnancy, labour and the postpartum period. Mhlongo (2016), further states that this care includes the method of foetal monitoring during labour; promotion of normal births, prevention and early detection of complications in both mother and foetus, providing access to medical care or other appropriate assistance and where appropriate, carrying out of emergency measures.

According to Hindley, Hinsliff and Thomson (2006), over the last 20 years, the United Kingdom has implemented a routine used by midwives during intrapartum foetal monitoring using Electronic Foetal Heart Monitoring (EFM), also known today as cardiotocography (CTG) monitoring, regardless of the risk status of labouring women. Pinas and Chandraharan (2016) further clarified that the cardiotocography (CTG) monitor was first introduced in the late 1960s to help record the foetal heart rate (FHR) and uterine contractions during labour to determine the foetal well-being. Its introduction was developed to enable midwives to analyze changes in the foetal heart rate, so they could initiate timely intervention.

Mishra and Sinha (2014) also claim that, In the Western world, continuous electronic foetal heart rate (FHR) monitoring is the most widely used technique for assessing the foetal status during labour. It has been shown to increase maternal intervention rates. In England, the rate rose from under 3% in the 1950s to 12% in 1990 and 21% in 2000 (Government Statistical Service, 2002). According to Chandraharan and Arulkumaran (2007), accurate utilization and interpretation of CTG are essential in identifying fetuses that show pathological conditions that may indicate hypoxia and birth asphyxia, in labour.

According to Pearson, Larsson, Fauveau and Standley (2007), 30 million women in Africa become pregnant each year and about 250,000 of them die from pregnancy related causes. Furthermore, one third of nearly one million stillbirths occur during labour, and approximately 280,000 babies die of birth asphyxia soon after birth. The leading causes of these increasing statistics revolve around issues related to lack of resources and inadequate monitoring of maternal and foetal conditions, particularly the foetal heart, because the traditional Pinard stethoscope may be incorrectly used and Doppler ultrasound or CTG monitors are not widely available.

A study conducted by Du Preez (2010), at the University of North West found that, as a developing country, South Africa faces challenges related to the health care system, as it struggles to meet the health-for-all criteria against a backdrop of staff, especially midwife, shortages. Unhealthy practice environments are a reason for the problem, as such environments have an impact on the job satisfaction of the midwives, as well as on patient satisfaction.

A study conducted by Thopola and Lekhuleni (2015), in Limpopo Province, found a gap in the midwifery practice environments because of the shortage of human and material resources, bringing about unsafe, unattractive, and inadequate practice environments. Midwives were unable to monitor the foetal condition during intrapartum management because the CTG machines were not functional.

According to Hindley and Thompson (2007), midwives' knowledge and experiences related to the use of CTG monitoring is based on the perception that it would provide a legal defence in the event of litigation and would help to defend their practice in the event of a legal claim. However, some midwives stated that, despite the paper print out of the heart rate or CTG, provoking anxiety helps to proof that the foetus was not compromised whilst in their care.

Hospital A and Hospital B are institutions that provide district health services to their neighbouring communities. Both these hospitals provide maternity services in the public sector rendered by both midwives and obstetricians. Registered midwives are expected to practise their duties within the parameters of their scope of practice, such as promoting and conducting normal births, prevention and early detection of complications in both mothers and foetuses, providing access to medical care or other appropriate assistance and, where appropriate, carrying out of emergency measures (ICM, 2014). The researcher, therefore, is impelled to undertake this research study on the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units at Hospital A and Hospital B, Waterberg District in Limpopo Province, from the perspective of the midwives.

1.2 Problem statement

Since the introduction of the CTG monitor, the availability of good resources is needed to enable midwives to manage and implement the new system of midwifery practice when monitoring pregnant women during labour using the CTG monitor, therefore, shortage and unavailability of CTG monitor does not allow enough practice by the midwives. On the other hand, lack of practice compromise the knowledge of the midwives and thus result in poor practice. The researcher has observed that they are few material resources and midwives are sorely lacking knowledge in using the CTG monitor. Her observations were triggered by Oleiwi (2018) who stated that changes in midwifery practice places exert external pressure and challenges on midwives due to the unavailability of machines and their lack of technological knowledge about the use and interpretation of CTG traces and recommended that in-service training programmes be offered to midwives at the maternity hospitals.

In 2015, in Limpopo province, a gap was recognized in midwifery practice environments, based on the material resources where midwifery practitioners were unable to monitor the foetal condition during intrapartum management since the CTG monitors were not functioning. This resulted in unsafe, unattractive and inadequate practice environments (Thopola & Lekhuleni, 2015). Midwives in the clinical area, therefore, had challenges in offering service based on the expected norms and standards of providing quality care to pregnant women. In the context of the current

study, the researcher wants to develop strategies to enhance the knowledge of midwives and their practices regarding the use of CTG monitors in labour units, particularly in Hospital A and Hospital B, Waterberg District in Limpopo Province.

1.3 Research question

The following question guided the researcher throughout the study:

What is the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units at Hospital A and Hospital B?

1.4 Aim of the study

The study aimed to determine the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units, at Hospital A and Hospital B, Waterberg District in Limpopo Province.

1.5 Objectives of the study

The research objectives are to:

- Explore and describe the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units at Hospital A and Hospital B, Waterberg District, Limpopo Province.
- Develop strategies to enhance midwifery practice and the knowledge of midwives regarding the utilization of cardiotocography in labour units in Hospital A and Hospital B, Waterberg District, Limpopo Province.

1.6 Theoretical framework

According to Butts and Rich (2017) cited in Meleis (2005), a theory is an organized, coherent, and systematic articulation of a set of statements related to a significant question in a discipline that is communicated in a meaningful whole. Swanson & Chermack (2013) believe that theory is formulated to explain, predict and understand phenomena, and in many cases, to challenge and extend existing knowledge within the limits of critical bounding assumptions.

1.6.1 Background

Avedis Donabedian, a physician and health services researcher at the University of Michigan, developed the original model in 1966. The model encompasses a three-component approach for evaluating the quality of care underpinning measurement for improvement (Figure 1.1). The three components are structure, process, and outcomes (Donabedian, 2005). Donabedian proposed using the triad of structure, process, and outcome to evaluate the quality of health care. He defines “structure” as the settings, qualifications of providers and administrative systems through which care takes place; “process” as the components of care delivered and “outcome” as recovery, restoration of function, and survival (Ayanian & Markel, 2016). In addition, improvements in the structure of care should lead to improvements in clinical processes that should, in turn, improve patient outcomes (Moore, Bourgeois & Lapointe, 2015). Furthermore, Ghaffari, Jahani, Jafarnejad and Esmaily (2014) see Donabedian model as an appropriate framework for health care assessment as it pays attention to raising client awareness and satisfaction with the outcomes.

Figure 1.1 shows a schematic diagram of the Donabedian model adapted from Mhlongo (2016)

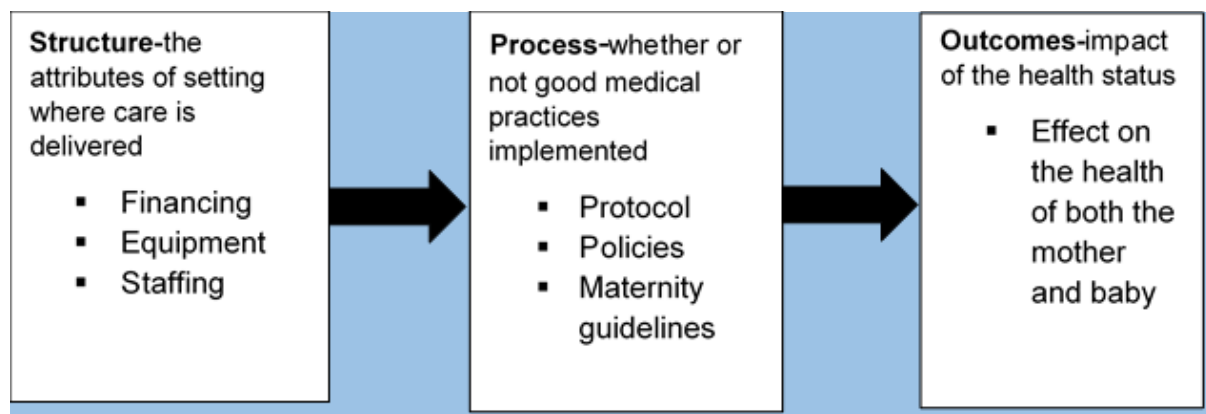


Figure 1.1 Donabedian Model framework

Figure 1.1 above, as interpreted by the researcher, shows that the structure represents the setting in which maternal care takes place. It includes midwives’ experiences and the availability of equipment like CTG monitors. Process standard refers to the protocols, policies, maternity guidelines, midwives’ knowledge and the implementation

of the guidelines and policies in labour units. Finally, the outcome standard represents the impact of the health care rendered to women.

1.6.1.1 Structure

Structure describes the context in which care is delivered, including hospital buildings, staff, financing, and equipment (Donabedian, 2005).

The structure is the stimuli, which could be either positive or negative depending on the attributes of setting in which maternal care takes place (labour units). It includes midwives' knowledge and the availability of equipment like CTG monitors used when caring for labouring women.

1.6.1.2 Process

Process denotes the transactions between patients and care providers throughout the delivery of healthcare (Donabedian, 2005).

The process refers to the protocols, policies, maternity guidelines, which are used by midwives to care for labouring and delivering women when using the CTG monitor. At times this is a problem due to the unavailability of CTG monitors which makes it difficult for midwives to trace the labouring women.

1.6.1.3 Outcome

Outcomes refer to the effects of healthcare on the health status of patients and populations (Donabedian, 2005).

The outcome refers to the impact of health care rendered to women during labour, monitoring the CTG which enables the midwives to detect any complications during the tracing to detect any disability (e.g. cerebral palsy) and death in utero.

1.7 Overview of the research methodology

Research is defined by McMillan and Schumacher (2010) as a systematic process of collecting and logically analysing data for a given purpose. A qualitative, exploratory, descriptive, and contextual research design was adopted for this study to determine the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units in Hospital A and Hospital B, Waterberg District in Limpopo Province. This section of the research methodology also includes descriptions of population,

sampling, sampling size, approach and technique, data collection, data processing and analysis and reporting (Brink, Van der Walt & Van Rensburg, 2012). In chapter 3 research methodology is discussed in detail.

According to Brink, Van der Walt and Van Rensburg (2012), a qualitative research design is used when little is known about the phenomena, or when the nature, context, and boundaries of phenomena are poorly understood and defined. Qualitative research assists researchers to access the thoughts and feelings of participants in research that may enable the development of understanding the meaning that people ascribe to their experiences (Sutton & Austin, 2015). In this study, the researcher was interested in studying the knowledge and practices of midwives regarding the utilization of cardiotocography (CTG) monitors when caring for pregnant women in labour units in Hospital A and Hospital B, Waterberg District in Limpopo Province.

1.8 Significance of the study

The study of the knowledge and practices of midwives regarding the utilization of CTG in labour units in the Waterberg District, particularly in Hospital A and Hospital B, might assist in the following ways:

- Give midwives a platform to elaborate on what assistance they expect from the hospital management. The information offered by the midwives could be used to help the Department of Health develop relevant training programmes to assist midwives with the management and implementation of CTG when caring for pregnant women during labour.
- Assist policymakers in the Department of Health in implementing new strategic changes in clinical areas and implementing new protocols.
- Lastly, it may assist in finding a way to address challenges experienced by midwives regarding the utilization of CTG monitors in labour units.

1.9 Outline of chapters

Chapter 1: This chapter provides an overview of the study by describing the context of the study, stating the problem studied, specifying the research objectives, aims and by outlining the theoretical framework as well as the significance of the study.

Chapter 2: This chapter provides a review of the research literature based on the knowledge and ideas of what is already known about the studied topic. It is undertaken to establish an understanding of the studied phenomena.

Chapter 3: Describes the research methodology and the research design which include the data collection method, population, and sampling, data analysis, ethical considerations and measures used to ensure trustworthiness.

Chapter 4: This chapter summarises the research findings.

Chapter 5: In this chapter, the researcher draws a conclusion, indicates the limitations of the study and makes recommendations based on the findings.

1.10 Conclusion

This chapter presents an overview of the study. The study is introduced and the background about knowledge and practices of midwives regarding the utilization of CTG are introduced. The research problem and theoretical framework adopted are described. The aim, research question, objectives and the significance of the study are outlined. The research method and research designs are summarised. Chapter 2 reviews the literature relevant to the study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter provides an overview of the existing base of knowledge and ideas about the knowledge and practices of midwives regarding the utilization of CTG in labour units. It summarises the framework of the research study within the context of what is already known about the phenomenon (Grove, Burns & Gray, 2012).

2.2 Purpose of the literature

A literature review is an essential aspect of any research study. Researchers use the review to place their studies within the context of what is already known about the topic and what pertinent research has been recently conducted (Williamson & Whittaker, 2017). Reviewing the literature involves the stages of: scanning, making notes, structuring the review and then writing it (Rowley & Slack, 2004).

The main purpose of a literature review is to summarize old interpretations of the topic and to integrate them with new interpretations from the emerging body of knowledge. Moreover, the review of the relevant literature enabled the researcher to become familiar with the existing knowledge base before collecting data related to the knowledge and practice of midwives regarding the utilization of cardiotocography in labour units.

2.3 Midwives' knowledge and practices when utilizing CTG

A study conducted by Parhizkar, Latiff and Aman (2012) regarding the knowledge of midwives about the usage of CTG has revealed that midwives lack knowledge regarding foetal investigations. Before they underwent a training programme, they were given a test and one third of the midwives gave wrong answers. The report further revealed that inadequate knowledge of midwives was significantly associated with age, educational levels, and work experience.

In Sweden, a study conducted by Jonsson, Lindeberg, Nordén and Hanson (2007) revealed that 76% of foetal distress and 70% of brain damage or death are related to incompetence in interpreting the foetal monitor tracing. This incompetence is the result of midwives' lack of knowledge and skills in electronic foetal monitoring, using CTG. Most midwives underwent disciplinary action as they were unable to recognize foetal distress. Injudicious use of oxytocin was found in 68.5% of the participants and was the primary reason for disciplinary action in 33% of them.

Brown, Bastian, Yasin, Dikshit, Grivell and Yates (2017) emphasize that health professionals should be aware that machines from different manufacturers use different vertical axis scales, and this can change the perception of the foetal heart rate variability. They claimed that midwives should not undertake continuous CTG monitoring in the absence of medical supervision. In South Africa, midwives are expected to report to a medical doctor if any signs of foetal distress are present and ensure that clear and accurate records are kept (Tities, 2012).

2.4 Poor interpretation of CTG by midwives leads to irrational decision-making

According to Steer (2008), the introduction of CTG monitoring to clinical practice is a significant method of reducing the incidence of birth asphyxia. On the other hand, it is also seen as a contributing factor to the rise in caesarean section rates. Panesar, Carson-Stevens, Salvilla and Sheikh (2014) further found that the interpretation of CTG was seen to be poor at a large University teaching hospital, regardless of regular CTG training and the use of standardized stickers.

In a study by Altaf, Oppenheimer, Shaw, Waugh and Dixon-Woods (2006), three errors of interpretation were noted in two cases, leading to suboptimal CTG usage. This should have activated a clinical response. In another case failure to interpret a CTG tracking correctly in the light of evidence from a foetal blood sample indicating no cause for alarm, resulting in a possibly unwarranted caesarean section.

2.5 Impact of CTG on the unborn baby and the mother

According to Signorini, Fanelli and Magenes (2014), CTG is universally accepted in clinical practice and it is recognised as one of the most information-rich of non-invasive diagnostic tests for prenatal monitoring. Nevertheless, the FHR signal is usually analyzed by detecting and measuring morphological characteristics whose clinical relevance is established mainly by eye inspection.

According to Pehrson, Sorensen and Amer-Wåhlin (2011), a reduction in neonatal morbidity and mortality was expected when CTG was introduced into clinical practice, as intrapartum asphyxia was believed to be the major cause of cerebral palsy and long-term neurological impairment.

Furthermore, according to Harding (2016), CTG is considered a very safe test as it does not produce any radiation. However, it may prevent patients from being able to move around freely during labour, depending on the type of machine used. When CTG is used unnecessarily, it may increase the patients' chances of having avoidable interventions such as forceps deliveries or caesarean sections. Women who have infections such as herpes, hepatitis B or C or HIV do not usually have internal monitoring, as it may increase the chance of passing the infection on to the baby.

Westerhuis, Kwee, van Ginkel, Drogtróp, Gyselaers and Vissera (2007) state that CTG interpretation is a difficult task, requiring clinical experience, skills, and significant expertise. Not knowing how to interpret CTG can lead to decisions to perform unnecessary caesarean sections. Certainly, incorrect interpretation of CTGs can lead to action of the potentially high risk of harm to women and babies. Brocklehurst (2016), also found that continuous electronic FHR monitoring in labour is widely used but its potential for improving fetal and neonatal outcomes has not been realized. The most likely reason is the difficulty of interpreting the fetal heart rate trace correctly during labour.

2.6 Midwives views regarding utilization of CTG

Midwives and obstetricians monitor the CTG combination of FHR and uterine contraction signals in delivery wards throughout the world to detect foetal hypoxia. Early detection enables them to act appropriately and to reduce the subsequent foetal and neonatal mortality (Chudáček, Andén, Mallat, Abry & Doret, 2014).

Hindley et al. (2007), conducted a study in two hospitals in England, where midwives attempted to manage the psychological burden of the threat of clinical negligence by using Electronic Foetal Heart Monitoring (EFM). This meant that some midwives used electronic monitoring regardless of the clinical need. The midwives' knowledge of the evidence relating to CTG monitoring was based on the perception that using this type of monitoring would provide a legal defence in the event of litigation.

Hindley et al. (2007), further found that although the midwives lacked confidence in the ability of EFM to accurately detect foetal compromise they were aware that the visual monitoring record was recognized as a valuable piece of legal evidence. The midwives' perceptions of professional self-efficacy in seeking to avoid a claim in clinical negligence contributed to defensive practice.

According to Harding (2016), using CTG is more effective than listening to a Pinard stethoscope or using a Doppler machine. However, CTG is not usually needed in normal low-risk deliveries, although in certain situations, continuous CTG monitoring is advised. These include:

- Pre-term labour or when the foetus seems smaller than expected;
- Patients with high blood pressure;
- Infection;
- Unusual position of the baby.

2.7 Role of technology in health

The use of technology in health care is a pervasive phenomenon, which manifests itself in a variety of ways and levels of sophistication, ranging from relatively simple mechanical devices such as the stethoscope to complex electronic devices (Sinclair, 2001). Sinclair (2001) suggests that midwives' attitudes towards the use of birth technology revolve around issues of trust and dependence. Yet there has been no published research to refute or substantiate these beliefs. Sinclair (2001) further indicates that technology in childbirth places a demand on midwives and obstetricians based on their technical competence levels and on their professional judgment, such as in deciding when to use it and in the interpretation of any readout.

According to the SANC (2013), registered midwives are expected to practise their duties within the parameters of their scope of practice. Devane and Lalor (2005) maintain that the initiation, management, and interpretation of foetal heart monitoring is complex and distributed across time, space and professional boundaries and that practices concerning foetal heart monitoring need to be understood within an organizational and social context.

Studies conducted by Strong and Jarles (1993); Freeman (2002); Devane and Lalor (2005) and McKeivitt, Gillen and Sinclair (2011) all conclude that CTG technology continues to have a role in monitoring and detecting abnormalities in the FHR, but this role is limited to how well the CTG is used and interpreted. The safe use of this technology is of prime concern to midwives and obstetricians, but studies show that the levels of agreement among professionals in the usage and interpretation of CTG foetal heart tracings are poor.

According to Bamard (2016), the integration of technology in care is a core business in nursing and this role requires that nurses understand and use technology informed by evidence that goes much deeper and broader than actions and behaviours. There is a need to delve more deeply into its complexity because there is nothing minor or insignificant about technology as a major influence in healthcare outcomes and experiences.

2.8 Appropriate interpretation of CTG

The appropriate use of the CTG machine in clinical settings is an issue of concern for midwives (McKevitt, Gillen & Sinclair, 2011). Sandelowski (2000) also found that the introduction of CTG has improved communication and reduced tension between midwives and obstetricians as it produced visual evidence of events that had occurred during the doctors' absence.

Thellessen, Sorensen, Hedegaard, Rosthoej, Colov, et al. (2017) in their study of CTG knowledge, interpretation skills, and decision-making, measured by a written assessment, found that these were positively associated with working in large maternity units with staff who had more than 15 years of obstetric work experience. This might indicate a challenge in maintaining CTG skills in small units and among experienced staff but could also reflect different levels of motivation, test familiarity, and learning culture.

According to Chapman and Charles (2018), to be able to interpret a CTG you need a structured method of assessing its various characteristics. The most popular structure can be remembered using the acronym DR C BRAVADO

DR Define Risk

C- Contractions

BRa- Baseline Rate

V- Variability

A- Accelerations

D -Decelerations

O - Overall impression

2.9 CTG as a communication tool between obstetrician and midwives

Sandelowski (2000) and McKevitt et al. (2011) found that the introduction of the CTG improved communication. However, this can be difficult if there is a poor consensus on how the CTG traces are interpreted.

According to Alfirevic, Devane and Gyte (2006), monitoring the foetal heart during labour has become a routine part of care, although access to such care varies across the world. Furthermore, McKevitt et al (2011) stated that the need for consensus regarding the use and interpretation of CTG is essential for safe and collaborative practice and will ultimately improve multidisciplinary relations between midwives and obstetricians.

The need for multidisciplinary teams in maternity care and inter-professional collaboration is of significance as it helps to solve the shortage of care providers in the maternity care system and guarantees improvement in maternity care services in rural areas (Behruzi, Klam, Dehertog, Jimenez & Hatem, 2017).

In addition, Harding (2016) found that because CTG measures the foetal heart rate and monitors the contractions in the uterus, it can be used both before birth and during labour, to monitor the foetus for any signs of distress. Through its use, one can view various aspects of the foetal heart rate and doctors and midwives use it to see how the foetus is faring.

2.10 Post basic courses

According to Duma, Dippenaar, Bhengu, Oosthuizen, Middleton, et al. (2014), specialist nursing midwifery is universally associated with post-basic courses that evolved in the 20th century to improve access to, and quality of, health service delivery.

Ntuli and Ogunbanj (2014), indicate that in South Africa, nursing education and practice have changes in response to the demands of current clinical practice. The strategies used must improve the knowledge and skills of healthcare workers involved in maternal care. The Department of Health (DoH) has initiated a programme of diplomas and master's degrees to train registered nurses known as 'clinical nurse

specialists' or advanced midwives to function with the increased responsibility of working independently in maternity units.

According to Ntuli and Ogunbanj (2014), there is a greater shortage of registered midwives with advanced midwifery training/diplomas in referral hospitals of the Limpopo Province. This has a potentially negative effect on reducing the high maternal mortality rate in the province.

2.11 Effectiveness of educational training programmes

According to Pehrson et al. (2011), in a study presented at the fourth annual Confidential Enquiry into Stillbirths and Deaths in Infancy (CESDI), the CTG interpretation component of obstetric care was questioned in over 50% of perinatal deaths. Therefore, regular training programmes for all health professionals involved in intrapartum care were recommended.

The scope of practice for a registered midwife entails the monitoring of the progress of the pregnancy, labour, and the puerperium. Upon completion and registration as a midwife, one must meet the minimum requirements to qualify as a practitioner as set out by the relevant statutory body (Tities, 2012 and Regulation 2598, 1984).

According to Tities (2012), in South Africa, student midwives receive midwifery practice in their third year of training. This implies that registered midwives only practice midwifery after two years of theoretical and practical exposure to midwifery which may lead to a gap in exposure to midwifery practice and skills acquisition.

Attendance of midwives at foetal monitoring education programmes increases their foetal monitoring knowledge and CTG interpretation skills. Irrespective of their years of clinical experience and exposure, midwives identified their need for CTG training (Devane & Lalor 2006; Tities, 2012). Continuous learning is an essential part of any healthcare worker's professional life to ensure professional and personal enrichment and development. This learning can be in the form of informal or formal training (Tities, 2012).

Pathological changes recognized on CTG tracings in hindsight are responsible for a considerable volume of obstetric litigation (Pehrson et al., 2011). The main reason for the poor outcomes lies in the generally poor standard of CTG interpretation. Therefore, more intensive training on CTG interpretation should be offered to enable all new staff members to consolidate their CTG interpretive skills before allowing them to practice in labour units (Westerhuis et al, 2007).

According to Altaf et al. (2006), midwives were generally satisfied with the training available for foetal heart monitoring, but many also emphasized the role of experience in using the equipment and making appropriate judgments.

According to Williams and Arulkumaran (2004), and Tities (2012), informal and formal training should be available to assist midwives in performing and interpreting electronic FHR patterns, to ensure that appropriate actions can be implemented and that high-risk factors can be identified. They advised that 6-monthly interval CTG study days would assist in keeping midwives and doctors up to date with CTG interpretation. All new staff should undergo induction training programmes to ensure that trained staff adequately assist women in labour and assess the well-being of the foetus.

2.12 Staff shortage

UNICEF (2008) reported that midwives are needed at many stages before, during and after delivery, in family planning clinics, maternity wards, post-natal units and even monitoring mothers for six weeks after delivery. One of the biggest challenges for maternal and neonatal health is the shortage of skilled health personnel. According to the World Health Organization (WHO), the world is facing a shortage of 4.3 million health workers, with every region except Europe showing a shortfall. More specifically, there are not enough skilled health workers like doctors, nurses or midwives to attend all the world's births.

UNICEF (2008) further indicates that shortages of skilled health workers arise from many factors such as underinvestment in training and recruitment, weak incentives for health care workers, low remuneration and high levels of stress. A heavy migration of skilled health workers from developing countries to industrialized nations spurred by the burgeoning demand for health workers in industrialized countries with aging populations has also taken its toll.

Mokoka, Ehlers and Oosthuizen (2011), in a study conducted between 1996 and 2005, claimed that South Africa produced almost 42% of midwives and nursing graduates from national education institutions. In addition, to there being few qualifying midwives, many young qualified midwives do not stay in practice. Another hindrance is the lack of recognition of post-basic qualifications. Additionally, unlike medical registrars, midwives have to pay for their studies, need to be on leave to attend lectures and do not receive special recognition for their additional skills. Often midwives leave the clinical workplace to become administrators, where they are likely to earn a higher salary and be professionally promoted.

According to Aluttis, Bishaw and Frank (2014), a total number of 270,437 of nurses are registered in South Africa today. Also, the World Health Organization (WHO) estimates that the world faces a global shortage of almost 4.3 million doctors, midwives, nurses, and other healthcare professionals. At this rate, the shortage will worsen. The opportunities for health workers to seek employment abroad have led to a complex migration pattern.

2.13 Shortage of equipment

There is evidence of difficulties in the availability and maintenance of equipment, and some deficits in staff knowledge and skill. Differing orientations towards foetal monitoring were reported by midwives. These are likely to have an impact on practice (Altaf et al., 2006).

Perinatal mortality is closely linked to the availability of modern obstetric care. CTG machines are commonly used in high-income countries in the management of high-risk pregnancies. However, they are often unavailable in low-income settings, where the rates of complicated pregnancy are highest (Lawrence, Quarshie, Kathleen, Anderson, Peltzman, et al., 2016).

Thopola and Lekhuleni (2015) indicate a gap in the midwifery practice environment, based on the shortage of material resources, bringing about unsafe, unattractive and inadequate practice environments. Midwifery practitioners are unable to monitor the foetal condition during intrapartum management due to non-functional CTG machines.

Moyimane, Matlala, and Kekana (2017), found that medical equipment is an essential health intervention tool used by nurses for the prevention, diagnosis, and treatment of disease and the rehabilitation of patients. However, access to functioning medical equipment is a challenge in low- and middle-income countries. An estimated 50% to 80% of medical equipment in developing countries are not working, creating a barrier to the capability of health systems to deliver health services to patients.

Moyimane et al. (2017), further maintain that the shortage of medical equipment, either due to its unavailability or non-functioning because of low quality and poor maintenance, is a barrier to the ability of health systems to deliver quality health services. Nurses should be provided with functional medical equipment to provide quality nursing care.

According to Altaf et al. (2006), availability and maintenance of equipment are viewed as a problem by all midwives observed in a study. Midwives described their frustration at not being able to easily access equipment that was in good order and could be relied on to function correctly. Identified problem equipment included abdominal belt knots, paper getting stuck, having no system for reporting repairs, dirty or damaged belts. Furthermore, considerable frustration was expressed concerning the quality, availability, and maintenance of equipment for foetal heart monitoring.

2.14 Guidelines and protocols

According to Chudáček, Andén, Mallat, Abry and Doret (2014), the health status of the foetus can be assessed using the International Federation of Gynaecology and Obstetrics (FIGO) guidelines. These consist of a set of rules evaluating manually extracted temporal characteristics of CTG, such as baseline level, variability level, number and type of decelerations and their relation to contraction occurrence times.

In South Africa, maternal health care is one of the priority reproductive health issues that has been identified as requiring urgent attention. The purpose of the guidelines on maternity care is to guide Health Care Workers who provide obstetric and anaesthetics services in clinics, community health centers, and district hospitals. Failure to have and follow standard protocols at primary and secondary levels is one

of the commonly related problems. These guidelines should be used to develop protocols of management at provincial and institutional levels to reduce maternal deaths and improve the quality of care during and after pregnancy. Their wide dissemination and implementation through appropriate training is firmly supported (Maternity guideline, 2007 & 2015).

2.15 Conclusion

The literature review covers several issues that affect the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units. The reviewed studies give a clear picture of how midwives use CTG during labour and the integration of technology into health, as well as the interpretation of CTG trace.

CHAPTER 3 RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter focuses on the literature of previous studies to establish the relevance of the current study to those already studied. This chapter describes in detail the research design and methods used in the current study. These include the study site, research design, population, sampling method, data collection, data analysis, and ethical considerations.

3.2 Study site

According to Polit and Beck (2017), a setting is a physical location where data collection takes place. The study site was in Hospital A and Hospital B in the Mogalakwena local municipality. Both hospitals are in the Waterberg District, Limpopo Province (figure 3.1). Hospital A is a regional hospital situated 5 km outside Mokopane Township along Dudu Madisha Drive. It serves the nearby villages: Ga-Pila, GaMathou, Ga-Lelaka, Ga-chokoe, Ga-Molekane, Roiboek, Armoed, Strekwater, Hans, Skimming, Danisane, Ga-Masenya, Malepetleke, Ga-Kgobudi, Sekgoboko, GaMokaba, Ga-Magongoa, Tshamahanzi, Mapela, and Masodi. It is also the referral hospital for 5 hospitals in the Waterberg District, Odendal Hospital, Belabela Hospital, Voortrekker Hospital, George Masebe Hospital, and Elisrus Hospital.

Hospital B is a District hospital situated 2 km from Mokopane Central Business District (CBD). It serves the nearby villages of Ga-Madiba, Sekgakgapeng, Mokgopong, Mahwelereng, Masodi, Moshate, Phola Park, Hospital View, Mzombana Roedtan, Chroma Park, and Neil Park.

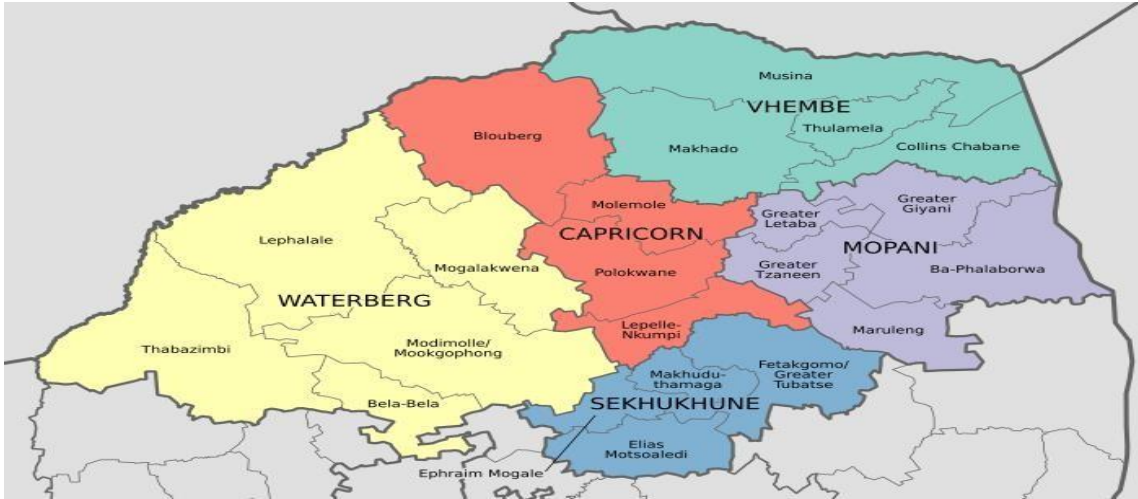


Figure 3.1: Map of Limpopo province showing Limpopo Districts and Sub Districts

Figure 3.1 above, shows the map of Limpopo province indicating Limpopo District and Sub-district. The study was conducted in Waterberg district.

3.3 Research design and methods

The researcher used a qualitative research approach to explore and describe the knowledge and practices of midwives regarding the utilization of cardiotocography (CTG) when caring for pregnant women in the labour units of Hospital A and Hospital B to get a holistic picture of the problem. Polit and Beck (2017) define qualitative research as collecting data in the field at the site where participants experience the problem under study.

The participants' experiences were captured through in-depth, semi-structured interviews to gain an understanding of the phenomenon and to develop a real sense of their understanding of the situation. Participants were asked questions followed by more probing questions to elicit more information about the phenomenon. The central question was: "What is your knowledge and practice as a midwife of the utilization of the CTG monitor during labour?" A voice recorder was used to record the voices of the participants and field notes were taken down to capture important issues.

3.4 Research design

A research design is the arrangement of the conditions for the collection and analysis of data in a manner that aims to combine relevance to the research (Kumar, 2014). A qualitative exploratory design, descriptive design, and contextual design were used to obtain complete accurate information about the problem studied.

3.4.1 Exploratory research design

An exploratory research design, as described by Frodermann (2018), is the process used to gain new insights, develop new ideas and to increase knowledge and formulate propositions about a phenomenon. In this study, it was used to explore the dimension of the phenomenon, the way it is manifested and factors to which it is related (Botma, Greeff, Mulaudzi & Wright 2010). To gain insight and understanding about the knowledge and practices of midwives regarding the utilization of CTG in labour units, the researcher asked one central question to explore the knowledge of midwives regarding the utilization of CTG in labour units, "Could you describe your knowledge and practices as a midwife regarding the utilization of CTG monitor during labour?"

3.4.2 Descriptive research design

Descriptive research design refers to an intensive examination of the phenomenon and their deeper meanings, thus leading to thicker descriptions (De Vos, Strydom, Fouche & Delpont, 2011). A descriptive research design was used to describe in detail the knowledge and practices of midwives regarding the utilization of CTG in labour units. The participants were given an opportunity to describe their knowledge and practices regarding the utilization of CTG in labour units.

3.4.3 Contextual design

According to Babbie (2010), contextual research describes and understands events within the concrete and natural context in which they occur. Allen and Chudley (2012) further define contextual research as a way of going out to get the information needed to fulfil the objectives of the study in the place where experiences occur. The study was contextual since participants were interviewed at their workplace where the researcher sought to explore the knowledge and practices of midwives regarding the

utilization of CTG monitor in labour units at Hospital A and Hospital B, Waterberg District in Limpopo Province through in-depth, semi-structured interviews. The researcher aimed at understanding the phenomenon under investigation as described by the participants in their lived world.

3.5 Population

Population as described by O'Sullivan, Berner, Taliaferro and Rassel (2016), is the complete set of people or other units whose attitudes and characteristics are of interest to the researcher. Furthermore, Castillo (2009), and Polit & Beck (2017), describe it as the entire aggregation of cases in which the researcher is interested. The study population included 36 midwives employed in the maternity units of Hospital A and Hospital B in Limpopo Province.

3.6 Sampling

A sample is a part or fraction of the whole population. A sample is selected from a population to obtain information regarding a phenomenon in a way that represents the population of interest (Eglitis & Chambliss, 2017). A non-probability purposive sampling technique approach was used as the researcher selected participants who were actively involved in labour units and were available and willing to participate in the study. The sample comprised 18 participants, 12 consented to participate from Hospital A and 6 from Hospital B.

3.6.1 Inclusion criteria

Grove, Burns and Gray (2014) and Salkind (2010) defines inclusion criteria are those characteristics that a participant must possess to be part of the target population. Midwives included in the sample for the current study met the following specific criteria:

- They had more than 2 years working experience in labour units;
- They had completed a midwifery course and were allocated to labour units in Hospital A and Hospital B at the time of data collection;
- They were available and willing to participate.

3.6.2 Exclusion criteria

Exclusion criteria are defined by Patino and Ferreira (2018) as features of the potential study participants who meet the inclusion criteria but present with additional characteristics that could interfere with the success of the study or increase the risk of an unfavourable outcome. The following participants were excluded from the study:

- All student midwives;
- Midwives who were not willing to participate;
- Midwives who were not allocated to the labour units at the time of data collection.

3.7 DATA COLLECTION

3.7.1 Preparation and information sessions

The researcher contacted the CEOs of both hospitals, as well as the unit nursing managers of the labour units, with the aim of building rapport and to discuss the involvement of the participants in the study and to plan dates to collect data. The researcher briefly indicated the purpose of the study, its objectives and the significance of the study. Also, she presented them with the approval letters from the Turfloop Research and Ethic Committee (TREC) and the letter of permission to collect data from the Limpopo Province Department of Health provincial office and the Waterberg District Manager.

Both the CEOs of the hospitals responded positively and allowed the researcher the opportunity to conduct the study. Participants were identified and selected from both hospitals and arrangements were made to conduct the interviews.

The information session was conducted on the day that the interviews took place. The researcher discussed issues related to what was expected from the participants during the interviews, the purpose of the study, objectives, the significance of the study, and the central question in the guide was explained.

The informed consent forms were explained to the participants who had agreed to participate in the study and signed as evidence of participating voluntarily in the study. The researcher explained the use of the voice recorder. The participants were informed about their right to withdraw from the study at any time without being

victimized and they were also made aware that the data that they would give would only be used for this study and further be published by submitting the research findings in an article to an accredited academic journal. The findings will also be made known through workshops and seminars so that other researchers can use the findings to research further on the topic.

3.7.2 Data collection instruments

3.7.2.1 Semi-structured in-depth interview

Data was collected through an in-depth, semi-structured interview with selected participants in a face-to-face encounter in a vacant office in the labour units. Each participant was visited at their workplace. The participants were informed about the research topic, questions, purpose and the significance of the study. A consent sheet (Appendix E) was provided and permission was obtained from the participants to conduct the interviews with them. The researcher conducted interviews on different days, according to the participants' availability. Interviews were conducted using an interview guide (Appendix F) Open-ended questions were provided on an interview guide to steer the participants' responses. All participants were asked the same questions.

Data was collected over different days from 17 February 2018 to 25 May 2018. A total of 18 participants were interviewed. Data saturation was reached after conducting twelve interviews, but the researcher continued with six more interviews to confirm that saturation had indeed been reached.

One central question was asked:

"Could you describe your knowledge and practices as a midwife regarding the utilization of CTG monitor during labour?"

The researcher listened attentively to the participants to gain more insight into each idea offered during the interviews. The interview sessions were recorded, and field notes were taken to capture important aspects of the interviews which could not be picked up by the voice recorder. The participants granted the researcher permission to use a voice recorder to capture the interview data. Participants were interviewed for about 30 minutes.

3.8 Bias

Bias is an influence that produces an error or distortion, which may affect the quality of evidence in both qualitative and quantitative studies (Terry, 2012). Pannucci & Wilkins (2010), state that bias prevents unprejudiced consideration of a question.

The current researcher avoided bias in the following ways:

- She withheld preconceived ideas about the knowledge and practices regarding the utilization of CTG;
- A non-probability purposive sampling was used to select participants from Hospital A and Hospital B;
- Incentives were not used to bribe participants to participate; they were treated with respect and were protected from exploitation;
- Written field notes and a voice recorder were used during data collection and analysis;
- During data analysis, transcripts were carefully read and coded, using themes and sub-themes;
- An independent coder verified the themes and sub-themes that emerged from the data.

3.9 Pilot study

A pilot study represents a fundamental phase of the research process. Its purpose is to examine the feasibility of an approach to be used in a large-scale study and to evaluate the feasibility of recruitment, randomization, retention, assessment procedures, new methods and implementation of the novel intervention (Leon, Davis & Kraemer, 2011). Pre-testing of the interview guide and voice recorder was carried out with two participants who were not part of the main study. The purpose of conducting the pilot study was to ensure that the participants understood what was required from them and for the researcher to make any necessary amendments to the interview questions.

3.10 Data Management

According to Guest, Namey and Mitchel (2013) data management is a designed structure, method or strategy for systematizing, categorizing, and filing research materials to make the data efficiently retrievable and duplicable. The collected data materials are kept under lock and key in the researcher's office, in a cabinet and were only made accessible to the individuals concerned in the research.

3.11 Data analysis

Qualitative data analysis is a method of examining social research data without converting them to a numerical format to discover underlying meanings and patterns of relationship (Babbie, 2013). Data was analyzed by reflecting on the possible meaning and relationships of the data. The researcher adopted Tesch's steps to analyse the qualitative data (Creswell (2013 & 2014).

Table 3.1: Tesch's eight steps of qualitative data analysis

Tesch's steps	Procedure
1.	Each interview was recorded by audiotape. The researcher listened to the recorded interviews carefully and transcribed the information verbatim.
2.	All the transcripts were carefully read to obtain a general sense of the information and to reflect on its overall meaning. Ideas that came up were written down.
3.	After the researcher had been through all the transcripts and identified topics, a list was made of all topics that emerged. Similar topics were grouped together into major topics, based on their relationship to each other and those that did not relate to others were clustered separately.

4.	The researcher returned to the data with the list of topics. The topics were then abbreviated as codes and the codes were written next to the appropriate segments of the text. The researcher tried this preliminary organizing scheme to see whether new categories and codes emerged and whenever new ones did emerge they were added.
5.	Themes and sub-themes were then developed from coding, and topics related to each other were grouped to reduce the total list of categories. After that, the researcher decided on the most descriptive wording for themes and sub-themes and lines were drawn between themes to show interrelationships.
6.	The researcher made a final decision about the abbreviations for each theme and sub-themes.
7.	The researcher gathered and analyzed the data which belonged to each theme.
8.	The researcher summarised the themes and sub-themes and sent the data to the independent coder after the coder had completed coding, common themes and sub-themes were identified and summarised and are discussed in detail in Chapter 4.

Figure 3.1 Summary of the Tesch's open-coding approach followed during data analysis

3.12 Measures to Ensure Trustworthiness

The following aspects of the research were considered to ensure trustworthiness: credibility, conformability, dependability and transferability.

3.12.1 Credibility

According to Strang (2015) and Conway (2014), credibility criteria involve establishing that the results of qualitative research are credible or believable from the perspective of the participant in the research. Credibility was ensured by prolonged engagement where the researcher stayed in the field for a period of 4 months, engaging with participants until data saturation occurred and ensuring that all interviews were audio

taped and field notes are written as a back-up. Data were transcribed verbatim by the researcher. According to Babbie and Mouton (2011), credibility refers to the compatibility between the constructed realities that exist in the minds of the participants and those that are attributed to them.

3.12.2 Confirmability

The conformability is based on how well the research inquiry is supported by the data collected (Fenton & Mazulewicz, 2008). In this study, it was ensured using tape recorded and written field notes as evidence that the data collected represented the information that the participants provided and that the interpretations of the findings were not fiction. Transcribed raw data and written field notes were compiled and sent to the supervisor and an independent coder to review. Conformability refers to objectivity and has the potential for congruence between two or more independent people about the data's accuracy, relevance and how to interpret it (Elo, Kääriäinen, Kanste, Pölkki, Utriainen, et al., 2014).

3.12.3 Dependability

Dependability was ensured by describing the research method to be used in detail. In addition, the voice recorder was used during the interviews to ensure that the data collected would be as accurate as possible. Dependability refers to the reliability of data to be used over time. If the investigation were repeated with the same or similar participants in the same context, its findings would be similar (Babbie & Mouton, 2011 and Polit & Beck, 2008).

3.12.4 Transferability

Transferability refers to the degree of similarity between the researcher site and other sites adjudged by the reader (Mangal & Mangal, 2013). Transferability was ensured through a dense description of the research design process, the method chosen, and purposive sampling. Participants were sampled until data saturation was reached and pre-testing of the data collection tool was undertaken to ensure that data collected would yield results that could be trusted and give outcomes that could be used to develop new departmental policies either for the institution where the study was conducted or for others. Transferability also refers to the ability to transfer the findings

of the study to another context or other participants (Arora, 2015 and Denzin & Lincoln, 2011). Tappen (2011) further defined transferability as the applicability of findings to other situations and other individuals.

3.13 Ethical Considerations

According to Zungu (2016), it is of significance that researchers protect their research participants, develop a trust relationship with them and promote the integrity of their research and that they guard against misconduct and impropriety that might reflect on the organization or institution.

The researcher adhered to the following ethical considerations when conducting this study:

3.13.1 Permission

Ethical clearance to conduct the study was obtained from the Turfloop Research and Ethics Committee (TREC). Further permission to conduct the study was obtained from the Department of Health Provincial Office Limpopo Province, Waterberg District Manager, the CEOs and the unit managers of Hospital A and Hospital B maternity units.

3.13.2 Informed consent

Informed consent involves ensuring that participation is voluntary and that the informants are aware not only of the potential benefits of the research for the population but also of the personal and individual risk they take (Holloway & Galvin, 2016). Informed consent was obtained from all participants before the interview sessions. The purpose and objectives of the study were explained to them. They were made aware that participation was voluntary, and that they had the right to withdraw at any time if they wished to do so, without being victimized by the researcher or employer. Permission to use the voice recorder and field notes were also obtained from the participants.

3.13.3 Anonymity and confidentiality

Anonymity means that data obtained during the research study should not be traced back to the participants (Botma, Greeff, Mulaudzi & Wright, 2016). Anonymity was ensured by using code numbers instead of participants' names. The names of the hospitals where the study was conducted were omitted and each hospital was given a code name.

Botma et al. (2016), defined confidentiality as not divulging private information of participants to people who are not directly involved in the research study. Participants were told that the information shared would not be made available to any unauthorised person, the voice recordings and transcribed notes were kept under lock and key and were only made available to the independent coder and the supervisors. Participant information collected will remain anonymous and confidential (Grove, Burns & Gray, 2014).

3.13.4 Privacy

As defined by Grove et al. (2014), privacy refers to the freedom of an individual to determine the time, extent and general circumstances under which private information may be shared or withheld from others. To respect the participant's right to privacy, the researcher conducted the interview sessions in a private room away from distractions. A participant who agreed to participate in the research had the right to expect that information collected from or about them would remain anonymous and confidential (Brink et al., 2012).

3.13.5 Risk of harm

According to Shaw and Barrett (2006), researchers can never wholly guarantee safety in any research, but participants and researchers must be offered reasonable protection within any study, with appropriate arrangements in place should something go wrong. The risk of harm was avoided in the study, as the research had arranged counselling for participants who might experience emotional or cognitive disturbance because of the interviews. Risk of harm refers to the probability and the magnitude of harm or discomfort, such as physical, psychological, and emotional that might occur because of participation in a research study (Polit & Beck, 2017).

3.4 Conclusion

In this chapter, the researcher briefly discusses the way the study was conducted. She describes in detail the qualitative, exploratory, descriptive and contextual research design adhered to in this study. Semi-structured interviews with a guide were used to collect data until data saturation was reached. Written field notes and a voice recorder were used when collecting data. Tesch's open-coding method was used during data analyses.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Introduction

Chapter 3 outlines the research methods used in conducting this study of the knowledge and practice of participants regarding the utilisation of CTG in labour units. Semi-structured interviews were used to collect data from selected and consenting participants. In this chapter, the findings are presented, analysed, discussed, interpreted and supported by the literature. The study results and participants' verbatim statements are presented in italic format.

4.2 Characteristics of the participants

Table 4.1 Summary of participants

Characteristic	Numbers
Participants no	
Hospital A	12
Hospital B	6
Departments	Labour units
Nursing specialty	
General midwives	10
Advance midwives	8

Table 4.1 Describes the key characteristics of the participants. The 18 participants were all midwives who had consented to participate in the study. They were employed at the selected hospitals and their working experience ranged from 2 to 18 years. The participants were drawn from the labour units of the hospitals chosen for the study.

4.3 Themes and sub-themes

Two themes and ten sub-themes emerged from the results of the study. The themes were: 1. Utilization of CTG and 2. Distribution of material and human resources. The identified themes and associated sub-themes are outlined in table 4.2 below.

Table 4.2: Themes and sub-themes identified through data analysis

Themes identified	Sub-themes
1. Utilization of CTG	1.1 Utilization of CTG to monitor foetal well-being by midwives 1.2 Interpretation of CTG trace by midwives 1.3 Importance of CTG in midwifery care 1.4 Teamwork among health care professionals 1.5 Midwifery in-service programme for midwives 1.6 Integration of technology in health care 1.7 Standardized utilization of CTG in midwifery care
2. Distribution of material and human resources	2.1 Shortage of material resources 2.2 Shortage of human resources 2.3 Maintenance of equipment

4.3.1 Theme 1: Utilization of CTG

The finding of this study pointed out that participants were of the view that CTG has a positive effect on the foetal well-being as it enables them to diagnosis and detect any abnormalities and take appropriate action according to the needs of the foetus. The views of the participants are described in the following sub-themes:

4.3.1.1 Sub-theme 1.1 Utilization of CTG to monitor foetal well-being by midwives

Participants in this study had stated that the use of CTG during labour to monitor the foetal well-being in utero and to detect any abnormalities encountered was effective. It has been found to contribute significantly to maternal and foetal well-being during labour. They expressed their opinions as follows:

Participant thirteen [13] (Hospital B): *“I think the utilization of CTG is very important since we can detect the problems with the foetus because if the patient is not done CTG or NST there are no ways we can know if the baby is fine or not. There are avoidable factors and non-avoidable factors so when we don’t use the CTG we won’t be able to know if the problem is avoidable, so we should do the tracing daily and on admission and when you see a problem call the doctor”.*

Participant two [2] (Hospital A):

“We use CTG to monitor the foetal well-being of the foetus in the mother, in a pregnant mother whether in labour or ante-natal. It is always used pre-natal, perinatal and intrapartum. So, when using this machine, we want to make sure that the foetal well-being is well and where there are challenges and abnormalities, we have to act.”

Participant three [3] (Hospital A):

“During labour we monitor every pregnant woman but not every pregnant woman per se. We look at conditions that this woman should get the CTG so the first woman that we trace using CTG is pre-term labour we do trace, preeclampsia. We trace and any medical condition, obstetric condition we do CTG.”

Participant seven [7] (Hospital A):

“We trace every patient on admission when they are in active phase during labour and if the doctor assesses the patient and asks for it to be done especially those with medical conditions such as diabetes, PIH, post-dates, and maternal age.”

Participant fourteen [14] (Hospital B):

“CTG we use it when the patient is in labour to monitor the foetal heartbeat. We use in mostly when they are in active phase of labour around 4 cm dilated.”

Participant six [6] (Hospital A):

“Here in our ward, we use it for all pregnant women and for those that they order it 4 hourly, and if the patient is not having any problem we do the CTG twice daily, in the morning and evening while others we do them continuously. I feel like I forgot something, but I will remember it.”

Participant thirteen [13] (Hospital B):

“Eeh... let me say we use it to patients who are in labour. We are using the CTG more often such as on patients who are on Pitocin regimen throughout labour until the patient delivers because the foetal condition can change at any time. Most of the time we also use the NST which is a non-stress test to the patients who are having some medical conditions such as diabetic, induced hypertension and some other conditions like patients who are having cardiac or post-dates, we want to see the reaction of the baby and together with any reaction or action of the uterus when the mother is not in labour.”

According to the SANC (2013), registered midwives are expected to practise their duties within the parameters of their scope of practice. Mhlongo (2016) further indicates that midwives are responsible for working in partnership with pregnant women to render the necessary support, care and advice during pregnancy, labour and the postpartum period.

According to Harding (2016), the use of CTG is more effective than listening to the Pinard stethoscope or using a Doppler machine. CTG is not usually needed in normal low-risk deliveries. However, in certain situations, continual monitoring with CTG is advised, for example, in pre-term labour or when the baby seems smaller than expected, patients with high blood pressure, infection or an unusual position of the baby.

4.3.1.2 Sub-theme 1.2: Interpretation of CTG trace by midwives

Participants' knowledge of the interpretation of CTG readings varied. Fourteen participants stated that they were competent regarding the interpretation of CTG, while the other four participants stated that they were not competent and that they relied on doctors and advanced midwives for second opinions. They expressed the following sentiments:

Participant thirteen [13] (Hospital B):

“Yes, I know how to interpret the strips when the patient is in labour, we use CTG and when she is not in labour we use NST non-stress test, we use the same paper to trace on both, but the interpretation is different since the patient who is done NST is not in labour and the patient who is done CTG is the one in labour. In NST the low lines will be showing foetal activity while in the CTG they will be showing contractions”.

Participant twelve [12] (Hospital A):

“I do understand how to interpret because the strip has all the variables that you need to consider.

Participant two [2] (Hospital A) and participant six [6] (Hospital A):

“They know how to interpret as they have done their advance midwifery”.

Further, those who were not competent expressed their views as follows:

Participant five [5] (Hospital A):

“I don't have proper knowledge about the device, but I only know that we use it on the pregnant women especially when we admit them and after we give the trace to the doctors for the second opinion because I'm not an advance midwife.”

Participant seven [7] (Hospital A):

“I don’t have any problem with the interpretation but if I am not certain, we have the advance midwives whom we ask even our doctors are very helpful.”

Participant seventeen [17] (Hospital B):

“Reason being others they don’t know how to interpret it, we end up having FSB, more especially the com-serves; they don’t know how to interpret.”

Westerhuis et al. (2007) believe the main reason for poor outcomes lies in the generally poor standard of CTG interpretation, therefore, more intensive training on CTG interpretation should be conducted to enable all new staff members to hone their CTG interpretive skills before allowing them to practise in labour units.

Studies conducted by Westerhuis et al. (2007) and Devane, Lalor, Daly, McGuire, and Smith (2012) reveal that a lack of knowledge in the use and correct interpretation of the CTG leads to unnecessary caesarean sections. Lack of knowledge in interpreting the CTG is associated with unnecessary decisions to perform caesarean sections. Certainly, incorrect interpretation of CTGs can lead to action that is potentially risky for women and babies.

According to Chapman and Charles (2018), the ability to interpret a CTG requires a structured method of assessing various characteristics. The most popular structure to adhere to can be remembered using the acronym DR C BRAVADO: DR Define Risk, C- Contractions, BRa- Baseline Rate, V- Variability, A- Accelerations, D – Decelerations, and O - Overall impression.

4.3.1.3 Sub-theme 1.3: Importance of CTG in midwifery care

Eleven participants expressed the opinion that using CTG is effective and time saving as they can take appropriate action without any delay. It is more effective than the old method of using a foetal stethoscope and this means more lives can be saved. Seven participants had a different view as they believed CTG misleads them by giving wrong readings. The opinions were as follows:

Participant six [6] (Hospital A):

“Yeah...It does because when you compare the olden method of using foetal stethoscope it was really delaying in a way and at times you find that you can't even hear the heartbeat but with the use of CTG things are much better as we can manage and take appropriate actions.”

Participant fifteen [15] (Hospital B):

“If we were using the foetal stethoscope only with this huge number of patients coming in and out we would not have made it in most case as you know that the issue of maternal death in our department is so sensitive in a way that they expect us to have followed all the procedure when we care for these patients. But now that the CTG is there we can manage easily, and we can see any abnormalities and take relevant actions.”

Participant seventeen [17] (Hospital B):

“It makes our work to be easy and simple, I can put a woman on CTG and move to another one but with foetal scope I have to stand for long hours trying to hear the foetal heart. I can progress three patients at the same time.”

Participant five [5] (Hospital A):

“It is helpful even if there is a shortage of machine but generally it saves time as we can manage more patients in a short period of time unlike when we use the foetal stethoscope which takes about 1 hour on one patient.”

Participant eight [8] (Hospital A):

“It is effective and saves time and you don't spend more time on one patient because you can set it so that when is done it alarm you.”

Participant seven [7] (Hospital A):

“CTG save a lot of time especially in our situation because this hospital is a regional hospital most patients are referred here from as far as Elisrus hospital, so you can imagine the overload we have with the shortage of staff.”

Participant twelve [12] (Hospital A):

“Eish... from my personal perspective I see them as being useful because the CTG are user-friendly and effective as they can show the abnormalities unlike when we use the foetal stethoscope and again they save time when managing the patients especially during the busy days.”

Participant ten [10] (Hospital A):

“CTG is more effective and save time more especially if you find a problem on a patient, we can act fast and take the patient to c/section without any delay as compared to foetal stethoscope which you cannot even see the abnormality of the foetal heart”.

Participants who had a different view:

Participant fourteen [14] (Hospital B):

“I don't think I have any question. It is just that sometimes the CTG tracing is time consuming when you are admitting more patients and there is a shortage of staff and you must trace all patients.”

Participant four [4] (Hospital A):

“I had an experience when I was admitting a patient at that time I had no foetal stethoscope with me and the patient was about to bear down so I had to use the CTG and it showed the foetal heart rate within normal limits but I had some doubts because I saw some liquor coming and it was so dark and I asked myself if there is a foetal heart the liquor would not be like this then the mother just pushed and the baby was macerated while according to the CTG the foetal heart was normal with a baseline of 136-137.”

Participant eleven [11] (Hospital A):

“No, it can mislead, because it can pick up the maternal pulse if the mother is having a tachycardia where else we have a macerated stillbirth with a reactive CTG. So CTG can mislead. We must always compare the maternal pulse and the sound of the CTG, so we can know if it is a foetal heart or maternal pulse. If we are not careful in doing that we will be misled at the end of the day.”

Participant sixteen [16] (Hospital B):

“Mostly this CTG they give a wrong reading as if the woman is pregnant with twins where else there is only one foetus or at the time it says the foetus has bradycardia or tachycardia”.

Participant three [3] (Hospital A):

“Yes, the CTG is helping but sometimes it doesn't help because you will find that there is foetal distress and rush the patient to emergency c/section and find that the baby score 9/10-10/10 the baby was not even distressing. Somehow it is disadvantaging because we do unnecessary Caesars.”

The findings of the current study concur with Steer (2008) that for some participants CTG plays a role in increasing the number of caesarean sections. However, the introduction of CTG monitoring to clinical practices significantly reduced the incidence of birth asphyxia, although it also contributed to the rise of caesarean section deliveries.

Westerhuis et al. (2007) share the sentiment that poor understanding of CTG interpretation leads to unnecessary caesarean sections. As stated, CTG interpretation is a difficult task, requiring clinical experience and significant expertise. Lack of knowledge of CTG interpretation leads to inaccurate decisions about performing caesarean sections. Certainly, incorrect interpretation of CTGs may lead to actions with potentially high risks of harm to women and babies.

4.3.1.4 Sub-theme 1.4: Teamwork among health care professionals

The findings of this study reveal that participants work in collaboration with doctors to solve identified problems during the monitoring of patients in labour. They said that when experiencing challenges, they seek second opinions from doctors and advanced midwives; they do not solve the problems and take final decisions alone without consulting. They explained:

Participant seventeen [17] (Hospital B):

“No, we call the doctor and alert them what the machine is saying, and the doctor will decide from there or alternatively change the machine and use the other one to compare as to whether it will give the same readings”.

Participant two [2] (Hospital A):

“My understanding.... somewhere, somehow in other patients you might not be able to detect the abnormality of the foetus with the foetal stethoscope. So, with the use of machines really is going to help as you can see on the strip then you act on that, such as when they are decelerations you have to call the doctor so that action can be taken to save the life of the baby.”

Participant eleven [11] (Hospital A):

“Sometimes they do more especially when the foetal heart is not there, and you will find that it is a maternal pulse instead of foetal heart. But it is rare because the doctors confirm with the use of sonar in most cases”.

Participant seven [7] (Hospital A):

“I don't have any problem with the interpretation, but if I am not certain we have the advanced midwives whom we ask even our doctors are very helpful”.

Participant thirteen [13] (Hospital B):

“Sometimes our CTG's are not working properly since they are overused. At times you may find that there is a macerated still birth and the pregnant woman comes in with no foetal heart, but when you put the probes it will make the beats and when you compare it with the maternal pulse you can see that this is a

maternal pulse but while is saying 148-150. Usually, when you doubt something like that, you ask the doctor to confirm by ultrasound.”

Participant four [4] (Hospital A):

“I think to us as midwives we need to have the knowledge to use the foetal stethoscope because in case of an emergency I will be using my foetal scope meanwhile I am feeling the pulse of the mother. At some point, if I can't hear anything, I will just confirm with the CTG and the assistance from the doctors using sonar.”

The findings of this study support those of Behruzi et al (2017) who found the need for multidisciplinary teams and inter-professional collaboration in maternity care is of importance as it helps to solve the shortage of care providers in the maternity care system and guarantees improvement in maternity care services in rural areas. The need for consensus regarding the use and interpretation of CTG is essential for safe and collaborative practice and will ultimately improve multidisciplinary relations between midwives and obstetricians (Fox et al., 2000 and McKevitt et al., 2011).

A study, conducted by Brown et al. (2017), viewed midwives' using CTG in the absence of doctors differently. It claims that midwives should not undertake continuous CTG monitoring in the absence of medical supervision. However, in South Africa, midwives are expected to report to a medical doctor if any signs of foetal distress are present and to ensure that clear and accurate records are kept (Tities, 2012).

Sandelowski (2000) and McKevitt et al. (2011) found that the introduction of CTG improved communication by reducing tension between midwives and obstetricians, as it produced visual evidence of events that had occurred when the doctor was absent. However, this may be difficult if there is a poor consensus on how to interpret the CTG traces.

4.3.1.5 Sub-theme 1.5: Midwifery in-service training programme for midwives

The findings of this study reveal that senior midwives felt that the training of midwives is inadequate. Participants also stated that student midwives receive little experiential clinical learning as there are no mentors to guide them because of the issue of shortage of staff. As a result, student midwives end up working without any guidance and supervision. Most participants suggested that training programmes should be offered more often, especially to the newly appointed nurses and doctors so that they can practise independently and avoid continually asking the advanced midwives and experienced doctors for clarity interpreting the CTG strips. Participants had the following opinions:

Participant two [2] (Hospital A):

“The challenge that we come across is that we are short staffed and we have many student midwives 25 is a lot you may find that as per shift they are only 4 professional nurses labour ward and post-natal with all those students maybe post-natal the students are 6 with only 2 professional nurses and labour with 4 students and labour ward is a 7 bedded and when each bed has a patient heeeeeey.....is really too much...”

Participant three [3] (Hospital A):

“There is a need for a training programme because a lot of doctors especially interns don’t know how to interpret the CTG and even student midwives. Interpretation needs a serious in-service training so that they can stop running after doctors and say look at the CTG. They should know how to interpret them.”

Participant nine [9] (Hospital B):

“Yes, especially when coming to the new midwives as compared to the old once. Remember we did our midwifery long ago and we were using fetoscopy and the new ones are trained with the CTG I don’t think they were going to be able to hear the googoo (heart rate) through the foetal stethoscope.”

Participant five [5] (Hospital A) said further:

“I think if they can do workshops it can be better because I have been here for so many years, but I haven’t received any formal training about them.”

Participant ten [10] (Hospital A):

“Yeah.... Because not all of us understand the tracings, so if they can provide us with the training it will really help as they do with HIV and AIDs and breastfeeding workshops.”

Participant sixteen [16] (Hospital B):

“Ever since I was here, I have never seen such; we just had the advantage of doing it at school. There should be training because I would think the CTG is normal while is not, and the baby is suffering.”

Participant six [6] (Hospital A):

“Since I was employed here I never received any in-service training and it would have been better more especially to new employees and students because if there are accelerations and decelerations and you can’t see them, the baby will suffer.”

Participant eight [8] (Hospital A):

“Yes, we do teach each other more especially when they are com servers, so they can know since they are fresh from school”.

Participant eleven [11] (Hospital A):

“Not necessary a formal training the only one we had was when I was schooling, and doctors do teach us during ward rounds that when they tell us how to interpret and how to put the machine and how to locate the foetal heart that’s the only training I can say. Regarding a training where someone from the company comes and addresses it I have never had it.”

A study was conducted regarding the knowledge of midwives about the usage of CTG and a lack of knowledge was discovered regarding foetal investigations before the training programme started, where one third of the nurses gave wrong answers. The report further revealed that inadequate knowledge of midwives was significantly associated with age, educational level and work experiences (Parhizkar et al., 2012).

Tites (2012) found that, in South Africa, student midwives receive midwifery training, most commonly in the third year of their training programmes. This implies that registered midwives only practise midwifery after two years of theoretical and practical exposure to midwifery which may lead to a gap between exposure to midwifery practice and skills acquisition.

Williams and Arulkumaran (2004) and Tities (2012) indicate that, to assist midwives in performing and interpreting electronic foetal heart rate patterns, informal and formal training should be available to ensure that appropriate action is implemented and that high-risk factors can be identified. They advised that 6-monthly interval CTG study days would assist in keeping midwives and doctors up-to-date with CTG interpretations. All new staff should undergo induction training programmes to ensure that trained staff assist women in labour and assess the well-being of the foetus.

4.3.1.6 Sub-theme 1.6: Integration of technology in health care

Participants in this study have a strong view that the introduction of technology into health care plays a huge role, especially with the introduction and utilization of CTG compared with the old method of using foetal stethoscope. However, some had different views about it as they believed it increased the number of unnecessary caesarean sections, as it misleads them.

They said:

Participant thirteen [13] (Hospital B):

“CTG is playing an important role because if we were not having the CTG’s we were not going to be able to know if the foetal heart is fine or not even though we can use the foetal stethoscope. The problem with the foetal stethoscope is that you cannot print the trace while with the CTG you can print for 20minutes and see any abnormalities and attend the problem.”

Participant one [1] (Hospital B):

“Yes. It saves time. Most problems we can detect them unlike when we use foetal stethoscope and we can check four patients at a time by putting them on the CTG unlike when using a foetal stethoscope because you have to do them one by one.”

Participant six [6] (Hospital A):

“Yeah.....because when you compare it with the foetal stethoscope the CTG can easily pick up the heartbeat immediately when you place it on the abdomen unlike the foetal scope because you take time searching for it, again with the CTG you can see the abnormalities.”

Participant fifteen [15] (Hospital B):

“If we were using the foetal stethoscope only with this huge number of patients coming in and out we would not have made it in most case as you know that the issue of maternal death in our department is so sensitive in a way that they expect us to have followed all the procedure when we care for these patients. But now that the CTG is there, we can manage easily, and we can see any abnormalities and take relevant actions.”

Participant eighteen [18] (Hospital A):

“It is very much helping because with the foetal stethoscope you cannot hear the beat to beat and if the baby is breathing well.”

Participant sixteen [16] (Hospital B):

“It does. Imagine when we are using foetal stethoscope, you can't trace for 30 minutes standing in the patient's abdomen, but with technology, you can put the patient on the machine, and it records. It makes life to be easy.”

Some participants had different views:

Participant three [3] (Hospital A):

“Yes. The CTG is helping but sometimes it doesn't help because you will find that there is foetal distress and rush the patient to emergency c\section and find

that the baby score 9/10-10/10 the baby was not even distressing. Somehow it is disadvantaging because we do unnecessary caesareans.”

Participant eight [8] (Hospital A):

“It depends... because if the patients are many and we are using it regularly it ends up giving wrong readings at times it says the patient has bradycardia where else the baby is fine.”

Participant four [4] (Hospital A):

“I have a doubt. I had an experience when I was admitting a patient at that time I had no foetal stethoscope with me and the patient was about to bear down so I had to use the CTG and it showed the foetal heart rate within normal limits but I had some doubts because I saw some liquor coming and it was so dark and I asked myself if there is a foetal heart the liquor would not be like this then the mother just pushed and the baby was macerated while according to the CTG the foetal heart was normal with a baseline of 136-137.”

The findings of this study are validated by Bamard (2016) who indicates that the integration of technology into care is a core business in nursing. This role requires an understanding of technology. This is informed by evidence that goes much deeper and broader than actions and behaviours. We need to delve more deeply into its complexity because there is nothing minor or insignificant about technology as a major influence in healthcare outcomes and experiences.

Currently, monitoring the foetal heart during labour by one method or another appears to have become a routine part of care during labour, although access to such care varies across the world (Alfirevic et al., 2006). Technology in health care is a pervasive phenomenon, which manifests itself in a variety of ways and levels of sophistication, ranging from relatively simple mechanical devices such as the stethoscope to complex electronic devices (Sinclair, 2001).

4.3.1.7 Sub-theme 1.7 standardized utilization of CTG in midwifery care

The findings of this study indicate that guidelines and protocols are always utilized by the participants as a source of reference when caring for pregnant women as a way of improving the quality of care rendered to pregnant women during and after pregnancy.

They offered the following information:

Participant eight [8] (Hospital A):

“We have them on the notice board and maternity guideline that we use to care for patients especially those with medical conditions that need serious interventions.”

Participant four [4] (Hospital A):

“Ooooh we have protocols on how to manage the patients either be in labour or not and especially in high care they need the CTG it can be daily or twice a day. Even the doctors also order it in 30 minutes or 4 hourly according to the condition of the mother.”

Participant nine [9] (Hospital A):

“Usually when we trace the patients after we interpret the results so that if you spot anything abnormality you act either by calling the doctor or give relevant treatment according to the guideline.”

Participant three [3] (Hospital A):

“We do have protocols on the information board to guide us that this kind of woman need CTG, but our problem is that our doctors need CTG to every pregnant woman and if the CTG is none reassuring they say you should repeat the CTG while they are not doing anything with the tracing even when there is a need to do an intra-uterine resuscitation. They just say repeat; you can even end up repeating 3 times to one pregnant woman of which is not fine.”

The findings of this study are echoed in the maternity guideline (2007 & 2015). It outlines that in South Africa maternal health care is one of the priority reproductive health issues that has been identified as requiring urgent attention. The guidelines on maternity care were implemented to guide Health Care Workers providing obstetric and anaesthetic services in clinics, community health centers and district hospitals. The guidelines should be used to develop protocols of management at provincial and institutional levels, to reduce maternal deaths and improve the quality of care during and after pregnancy.

4.3.2 Theme 2: Distribution of material and human resources

According to the framework, material and human resources form part of the structure which is defined as the places where medical care takes place and the instrumentalities of each product. Further, it may include the features of the system, the service provider and the patient (Voyce, Gouveia, Medinas, Santos & Ferreira, 2015).

The current study found that all 18 participants thought that there was a shortage of both material and human resources. These are discussed in the following sub-themes. Participants also expressed dissatisfaction with the maintenance and servicing of the equipment.

4.3.2.1 Sub-theme 2.1: Shortage of material resources

Participants indicated that the shortage of essential equipment such as CTG monitors, makes it difficult for them to provide proper quality midwifery care. They indicated that not only was there a shortage of equipment, but there was poor quality and they are poorly serviced and often lead them not to use the CTG machine for every pregnant woman. They prioritized high-risk women like those with conditions such as preeclampsia and gestational diabetes. These sentiments are aptly expressed in the following excerpts:

Participant three [3] (Hospital A):

“We usually put patients with conditions such as gestational DM, hypertension, foetal distress, induction of labour and we need a paper trace before we induce

labour but even those without any conditions we do CTG is just that we prioritise.”

Participant eleven [11] (Hospital A):

“Is a problem my dear, but at the end, we don’t have a choice we usually prioritize with condition if the patient has certain condition we put that patient first and another thing is, when you progress patients the time for reviewing won’t be the same so that’s how we win them.”

Other participants expressed their challenges as follows:

Participant nine [9] (Hospital A):

“We don’t have enough CTGs and it becomes a challenge when for example you have put a patient on continuous CTG and you have to review others. The machine itself gets tired and starts to give wrong readings or freeze then it leads us to take more patients for c\section. Again, we are short staffed, and we end up not giving the patients the care they need.”

Participant two [2] (Hospital A):

“Really it is difficult; I can’t say we can prioritize because we might not know the progress in these patients. Basically, it will depend on the patient’s condition if the foetal heart is not fine then we remove the CTG from one patient to the other because with the foetal stethoscope we can’t, where else the other patients also need it, really it is a challenge.”

Participant four [4] (Hospital A):

“Yes, more especially when there is high-risk clinic because we admit more patients in the ward whereby the CTGs end up giving wrong reading because they are overworked.”

Participant nine [9] (Hospital A):

“There are not enough as we are receiving lots of patients from all over Mokopane and patients from local clinics. So, we are truly facing a difficult situation because the companies are no longer delivering anymore I don’t why.”

Participant eight [8] (Hospital A):

“We don’t necessarily cope we only adjust to the situation, isn’t we had four. There were new CTG that came they were called Phillips those once were the best more than the once we have now but unfortunately, they were not serviced enough I can say, they just died on us and now we are only left with two and it becomes strenuous to us. In ANC ward daily, they must do NST for all admitted women sometimes they come in labour to ask for the one that we have and when a patient comes in labour we must also go and ask it back. So that is a challenge that we are having.”

Participant one [1] (Hospital B):

“Not necessarily, when you see that this patient has a problem you can put them once a day. We also put patients who are not in labour as well; because the foetal heart can stop for some reason. We also have a challenge of not having papers to trace and it becomes a challenge if we have high-risk patients, so we don’t trace all patients on the paper strip.”

Participant thirteen [13] (Hospital B):

“We decide which patient we put first looking at the patient’s condition and we give that patient a machine that we think comes first and the others will follow. Those who are in labour we just put them on the machine that doesn’t print for continuous monitoring.”

The findings of this study coincide with those of Moyimane et al. (2017), who state that medical equipment is an essential health intervention tool used by nurses for the prevention, diagnosis, and treatment of disease and the rehabilitation of patients. However, access to functioning medical equipment is a challenge in low- and middle-income countries. It is estimated that 50% to 80% of medical equipment in developing

countries is not working, creating a barrier to the ability of the health system to deliver health services to patients.

According to Lawrence et al. (2016), CTG machines are commonly used in high-income countries in the management of high-risk pregnancies, whilst they are often unavailable in low-income settings, where the rates of complicated pregnancies are highest.

Thopola and Lekhuleni (2015), discovered a gap in the midwifery practice environment, based on the shortage of material resources, bringing about unsafe, unattractive and inadequate practice environments, where midwives are unable to monitor the foetal condition during intrapartum management because the CTG machines are not functional.

Altaf et al. (2006), state that midwives' frustrations are the result of not being able to easily find equipment that is in good order and can be relied on to function correctly. Considerable frustration was expressed concerning the quality, availability, and maintenance of equipment for foetal heart monitoring. Participants Identified problems such as paper getting stuck, having no system for reporting repairs, dirty or damaged belts, and missing parts.

4.3.2.2 Sub-theme 2.2: shortage of human resources

This study indicated that participants are faced with the challenge of being overworked due to shortage. They highlighted that their hospitals accommodate lots of patients from different places and the Waterberg District. This shortage has caused participants to end up being overworked on duty to try and cover the shortage, it only becomes better when they are students' midwives. Participants further expressed that they were short-staffed and yet at times they were expected to teach students midwives.

Participant two [2] (Hospital A) indicated that:

“The challenge that we come across is that we are short-staffed and we have many student midwives 25 is a lot you may find that as per shift they are only 4 professional nurses labour ward and post-natal with all those students maybe post-natal the students are 6 with only 2 professional nurses and labour with 4 students and labour ward is a 7 bedded and when each bed has a patient heeeeeeey.....is really too much...”

Participant seven [7] (Hospital A) said that:

“CTG saves a lot of time especially in our situation because this hospital is a regional hospital most patients are referred here from as far as Elisrus hospital, so you can imagine the overload we have with the shortage of staff.”

Participant ten [10] (Hospital A) also said that:

“The only challenge that we have is that the machines are not enough more especially with so much intake of patients and we have to teach students when they come here for exposure and we are really short staffed”.

The world is facing a shortage of 4.3 million health workers including midwives who are needed at many stages before, during and after delivery in family planning clinics, maternity wards, post-natal units and even monitoring mothers after six weeks of delivery. One of the biggest challenges for maternal and neonatal health is the shortage of skilled health personnel (UNICEF, 2008).

Aluttis et al. (2014), found that a total of 270,437 nurses are registered in SA today, but the world health organization estimates that the world faces a global shortage of almost 4.3 million doctors, midwives, nurses and other healthcare professionals. At this rate, the shortage is worsening. Opportunities for health workers to seek employment abroad have led to a complex migration pattern.

According to UNICEF (2008), shortage of skilled health workers arises from many factors including underinvestment in training and recruitment, weak incentives for health-care workers, low remuneration and high levels of stress. A heavy migration of skilled health workers from developing countries to industrialized nations has also taken its toll.

4.3.2.3 Sub-theme 2.3: Maintenance of equipment

The findings of this study indicate the frustrations of participants regarding poor or non-maintenance servicing of CTG machines. There was also a severe shortage of CTG paper traces leading to sub-standard midwifery care. These sentiments were expressed as follows:

Participant fifteen [15] (Hospital B):

“As you know that when a woman is in labour we do continuous CTG with a trace strip but with low-risk, we just check without tracing strip for a minute or 2 minutes. In our unit, we sometimes have a challenge of not having paper traces hence at times we just check without tracing.”

Participant one [1] (Hospital B):

“Here in the unit, we firstly report them where they come from. At times they do come and service them even though they take time as they are expensive, and you know that it is a procedure that requires a lot of money but currently we just use the once that are in good condition.”

Participant four [4] (Hospital A):

“Usually when they deliver the CTG machines, the company people used to come after 6 months. Nowadays they don't come anymore and even the machines are old at times we miss the foetal heart rate and end up taking the patients to the theatre.”

Participant five [5] (Hospital A):

“No, we don’t normally have. Ooooh, sorry we sometimes have a challenge of not having paper trace for a month or so”.

Participant eight [8] (Hospital A):

“We usually write works orders but repairing of equipment is one of the problems we are experiencing here in our hospital as we don’t have people who know how to fix or service them.”

The findings of this study reflect those of Moyimane et al. (2017) who state that responsive health systems guarantee communities’ equitable access to essential medical equipment of assured quality, safety, and cost-effectiveness. The shortage of medical equipment, either due to unavailability, non-functioning, low quality, and poor maintenance is a barrier to the ability of the health system to deliver quality health services. Nurses should be provided with functional medical equipment to provide quality nursing care. There is evidence of difficulties with the availability and maintenance of equipment, as well as some deficits in staff knowledge and skills. Differing orientations towards foetal monitoring are reported by midwives. These are likely to have an impact on practice (Altaf et al., 2006).

4.4 Results applied to theoretical framework

According to Pilot and Beck (2012) theory is a systematic, abstract explanation of some aspects of reality. Donabedian model of health care has been applied as a theoretical framework because the study is about determining the knowledge and practice of midwives regarding the utilization of CTG in labour units in Hospital A and Hospital B. The framework was based on evaluating the quality of care to promote measurement for improvement in the healthcare.

The components in the Donabedian framework are structure, process, and outcome. This study indicated significant procedures and attributes in the midwifery practices that were shared by participants in the care of pregnant women during labour in relation to the theory.

4.4.1 Structure

Structure describes the context in which care is delivered, including adequate facilities such as hospital buildings, staff, financing, equipment, and qualifications of care providers (Donabedian, 2005). Observing the findings discussed above participants complained of a severe shortage in the workplace. They reported that it is difficult for them to work understaffed because it leads them to compromise the health services of patients since they are overworked with many patients coming in and out of their hospital as it is a referral for many clinics and surrounding hospitals.

4.4.2 Process

Process indicate the transactions between patients and providers throughout the delivery of healthcare. It examines how care has been provided in terms of appropriateness, acceptability, completeness or competency. The provision of health care is fulfilled through the incorporation of different processes to deliver care such as diagnosis, treatment, and preventive care (Donabedian, 2005).

In this study, the process from the Donabedian model refers to the utilization of CTG, protocols and maternity guidelines which are utilized by participants to render care to labouring and delivering women. Participants use protocols and guidelines to help them to diagnose and give patients relevant treatment as they can detect any abnormalities and act in accordance with their findings. Although there was a great shortage of CTG equipment, participants continued to improvise and render the necessary services.

4.4.3 Outcome

Donabedian outcome concept indicates that the effect of healthcare has a direct impact on the health status of patients and populations. Participants in the study are faced with the challenge of being short-staffed and the shortage of equipment which has a negative impact on a conducive working environment for both staff and patients, therefore, staff members turn to take annual and sick leaves as a result of exhaustion. UNICEF (2008) reported that a shortage of skilled health workers arises from different factors such as underinvestment in training and recruitment, weak incentives for

health-care workers, low remuneration and high levels of stress which leads to heavy migration of skilled health workers.

4.5 Conclusion

This chapter discusses the data collected and the two themes that emerged, namely; utilization of CTG and distribution of material and human resources. These themes, together with the sub-themes, are discussed in detail, referring to the relevant literature and supported by recorded participants' verbatim statements. Chapter 5 constitutes the summary, limitations, strategies, recommendations and the conclusions of the study.

CHAPTER 5

SUMMARY, LIMITATIONS, STRATEGIES, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

This chapter summarises the findings of the study. It also indicates the extent to which the objectives of the study have been met and makes recommendations drawn from the findings of the study as discussed in chapter 4. Strategies are developed to enhance midwifery practice when utilizing cardiotocography in labour units.

5.2 Aim of the study

The study aimed to determine the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units in Hospital A and Hospital B, Waterberg District in Limpopo Province.

5.3 Objectives of the Study

The objectives of the study, as indicated in chapter 1, have been met and are evaluated as follows:

Objective 1:

- Explore and describe the knowledge and practices of midwives regarding the utilization of cardiotocography in labour units in Hospital A and Hospital B, Waterberg District, Limpopo Province.

This objective was achieved as outlined in the summary of the findings (section 5.4).

Objective 2:

- Develop strategies to enhance midwifery practice and the knowledge of midwives regarding the utilization of cardiotocography in labour units in Hospital A and Hospital B, Waterberg District, Limpopo Province.

This objective was achieved as indicated in the developed strategies (section 5.5).

5.4 Summary of findings of the study

The conceptual dimension of health care of Donabedian framework was adopted in the study. It includes structure, process, and outcome. Participants explained in detail their knowledge and practices regarding the utilization of cardiotocography in labour when caring for pregnant women as indicated in the two themes and the ten subthemes that emerged. The themes and sub-themes were used to develop new insights about the topic studied and to develop strategies to improve midwifery practice and knowledge of midwives in labour units.

5.4.1 Utilization of CTG

5.4.1.1 Utilization of CTG to monitor foetal well-being by midwives

In the study, participants indicated that the utilization of CTG during labour is the best communication tool for them and doctors as it enables them to consult about the monitoring of the well-being of the foetus in utero and detect any abnormalities and decide on appropriate action.

Studies conducted by Sandelowski (2000) and McKeivitt et al. (2011), also found that the utilization of CTG is seen as a tool for improving communication. It reduces tension between midwives and obstetricians as it produces visual evidence of events that occurred in the absence of the doctors.

Ayres-de-Campos, Spong and Chandrachar (2015) say a good clinical judgement is required to diagnose the underlying cause for a suspicious or pathological CTG and to judge the reversibility of the conditions with which it is associated, and to determine the timing of delivery, with the objective of avoiding prolonged foetal hypoxia/acidosis, as well as unnecessary obstetric intervention.

The findings of this study support those of Chudáček et al. (2014) who indicate that in delivery wards throughout the world, the CTG combination of the FHR and uterine contraction signals are monitored with the aim to detect foetus hypoxia by midwives and obstetricians. Early detection enables obstetricians to act appropriately and to reduce foetal and neonatal mortality.

5.4.1.2 Interpretation of the CTG trace by midwives

The study found that participants had varied knowledge about the interpretation of CTG. Certain participants indicated that they were competent in the interpretations, while others were not. They indicated that to narrow the challenges they experienced when interpreting the CTG, they should be offered consistent in-service training and workshops to increase their knowledge and to empower them to be able to interpret the readings and to take rational action and make appropriate interventions.

Redman and Moulden (2014), maintain that the interpretation of CTG patterns is unreliable when done, subjectively, by eye. Computerized analysis ensures consistency and relates the many patterns to the outcome in an evidence-based way.

According to Chapman and Charles (2018), to be able to interpret a CTG you need a structured method of assessing its various characteristics. The most popular structure to adhere to can be remembered using the acronym, DR C BRAVADO.

Attendance of midwives at foetal monitoring education programmes increases their foetal monitoring knowledge and CTG interpretation skills, Irrespective of their years of clinical experience and exposure (Devane & Lalor, 2006; Tities, 2012).

5.4.1.3 Importance of CTG in midwifery care

The current study found that CTG is used for every pregnant woman entering labour units to monitor foetal well-being from the latent phase to the active phase of labour and to detect any abnormalities in utero. Participants were of the view that CTG is more effective and time saving than the old method of foetal stethoscopes. Although it is a challenge to monitor every pregnant woman entering labour units due to a shortage of CTGs, participants end up prioritizing patients according to their condition. Those with high-risk conditions which could be life-threatening for both the mother and the foetus are prioritized.

According to Bhogal (2017), adequate monitoring of uterine contractions is an essential part of cardiotocography. It allows for the assessment of the foetal heart rate in relation to the uterine contractions, especially when there is a non-reassuring or abnormal trace.

5.4.1.4 Standardized utilization of CTG in midwifery

This study found that when participants use protocols and guidelines it helps them to diagnose and give patients relevant treatment as they can detect any abnormalities and act in accordance with their diagnosis. Although there is a great shortage of CTG machines, the participants continue to render their best service to patients.

All actions taken by participants when caring for pregnant women are best described by the Donabedian dimension of the process which includes the sum of all actions that make up healthcare. The provision of health care is fulfilled through the incorporation of different processes to deliver care, such as diagnosis, treatment, and preventive care. In the study, the process is based on the utilization of the protocols and maternity guidelines which are followed by midwives to render care to labouring and delivering women using CTG monitors.

A study conducted by Van der Pijl, Groenestege, and Verhoeven (2019), validates that midwives are happy performing antenatal CTG and feel it contributes positively towards the midwife-client relationship. However, midwives experienced an increased workload, partly due to time-consuming technical difficulties. Furthermore, mixed feelings existed on whether antenatal CTG contributes to a more physiological or to a more pathological approach in midwifery practice. Most midwives believed that performing antenatal CTG contributes to the physiological process such as the strengthening of their gate-keeper role, the increased confidence of their clients and improved midwife-client relationships.

5.4.2 Distribution of material and human resources

5.4.2.1 Shortage of material resources

Participants stated that the availability, shortage and overworked equipment results in situations that are not conducive to their performing their duties efficiently. They find it difficult to perform their duties according to the scope of practice and maternity guidelines. It has been identified that some equipment breaks because of the heavy load on it because of the number of pregnant women its services. Most participants felt that the issue of insufficient equipment is due to the poor quality of the machines

and its poor servicing which often lead to their not using the CTG machine for every pregnant woman but having to prioritize high- risk women.

Ayres-de-Campos et al. (2015), state that unexpected complications may occur during labour, even in patients without prior evidence of risk, so maternity hospitals need to ensure the presence of trained staff, as well as appropriate facilities and equipment for an expedited delivery.

Another challenge reported by participants was that if CTG machines are broken and need to be repaired problems are often encountered because maintenance service personnel often take a long time to repair the machines and at times it revolves around the issue of not having competent service providers around the hospital to fix them. Equipment that was also reported to be unavailable in most instances included CTG paper.

Moyimane et al. (2017), stated that medical equipment is an essential health intervention tool used by nurses for the prevention, diagnosis, and treatment of disease and the rehabilitation of patients. However, access to functioning medical equipment is a challenge in low- and middle-income countries. It is estimated that 50% to 80% of medical equipment in developing countries is not in working order, creating a barrier to the ability of the health system to deliver health services to patients. Shortage of medical equipment, either due to unavailability, non-functioning, low quality, and poor maintenance, is a barrier to the ability of the health system to deliver quality health services. Nurses should be provided with functional medical equipment to provide quality nursing care.

5.4.2.2 Shortage of human resources

Participants complained of severe shortages in the workplace. They reported that it was difficult for them to provide quality midwifery care. Further, they reported that they were overworked due to the influx of patients from many clinics and neighbouring hospitals.

The great shortage results in a situation where participants must multitask to cover the shortages. The shortage of staff led to burn out, exhaustion and fatigue. This further led to absenteeism and participants reporting sick or taking annual leave.

UNICEF (2008), further indicated that shortages of skilled health workers arise from many factors such as underinvestment in training and recruitment, weak incentives for health care workers, low remuneration and high levels of stress. A heavy migration of skilled health workers from developing countries to industrialized nations spurred on by the burgeoning demand for health workers in industrialized countries with aging populations has also taken its toll on the health sector in developing countries.

5.5 Strategies to enhance midwifery practice and knowledge of midwives regarding the utilization of cardiotocography in labour units.

Table 5.1 Strategy 1: Increase the number of competent and knowledgeable midwives

Theme one: Utilization of CTG	
OBJECTIVE	To have enough advanced midwives in clinical areas
STRATEGY	Increase number of competent and knowledgeable midwives
APPLICATION	<ul style="list-style-type: none"> ▪ Advanced midwifery training should be provided to enhance participants' formative experiences which could reduce frustrations of midwives when managing patients presenting with complications. ▪ Well established nursing schools could also help improve the standard of midwifery care as well as extending the
	period of study for student midwives to gain more experience.

Table 5.2 Strategy 2: Continuous provision of education and training

Theme one: Utilization of CTG	
OBJECTIVE	To upgrade midwives' knowledge in midwifery practice
STRATEGY	Continuous provision of education and training
APPLICATION	<ul style="list-style-type: none"> ▪ Reinforcement of in-service training and workshops to improve service delivery rendered to patients as participants will be able to manage complications identified when monitoring women during labour using CTG. ▪ By conducting these pieces of training, the standard of midwifery care could further improve to fulfil the demands of the patient care. ▪ The role of training programmes could also assist participants with the knowledge and skills that would help them manage maternal and foetal conditions.

Table 5.3 Strategy 3: Availability of material and human resources

Theme two: Distribution of material and human resources	
OBJECTIVE	To optimize the distribution of resources for midwifery care
STRATEGY	Availability of material and human resources
APPLICATION	<ul style="list-style-type: none"> ▪ The Department of Health and hospital management should provide additional midwives and advanced midwives in labour units to avert the shortage of staff and to reduce incidents of midwives' reporting sick and taking leave due to exhaustion and fatigue. ▪ Availability of personnel can be addressed through an advertisement of posts. ▪ Placement of nurses with relevant qualifications in the units. Many midwives were of the view that most nurses with midwifery qualifications are allocated in

	<p>other units in which they are not rendering maternity service care, e.g. medical or surgical wards.</p> <ul style="list-style-type: none"> ▪ Ensuring the provision of equipment for effective midwifery care through the availability of useful resources, such as CTG. ▪ Realistic allocation of funds when drafting financial year plans to reduce the occurrence of poor maintenance and service delivery.
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5.6 Recommendations

Based on the findings of this study, the researcher wishes to make the following recommendations:

5.6.1 Utilization of CTG to monitor foetal well-being

- Midwives should be constantly provided with post basic midwifery courses to improve their knowledge.
- In-service training programmes, as well as workshops, should be frequently conducted at regular intervals.
- Collaborations of professionals so that midwives work together with obstetricians in the patients' interest and to be able to advocate for them.

5.6.2 Distribution of material and human resources

- Additional skilled midwives should be employed in clinical areas to reduce the shortages of staff and to ease the pressure of work for midwives.
- A guaranteed supply and availability of equipment should be ensured to promote the service delivery rendered to patients.
- Well established and proper planning for financial budget to be distributed in departments that are most in need.

5.6.3 Further research

The researcher recommends that further studies should be conducted nationwide on the knowledge and practice of midwives regarding the utilization of CTG in labour units as these could assist in getting a clear idea about the knowledge and practice of midwives regarding utilisation of CTG.

5.7 Limitations of the study

The study was conducted in two of the hospitals in the Waterberg district with a purposive sample of 18 participants. However, the result findings of this study cannot be generalized to other hospitals in South Africa. It is suggested that similar studies be conducted in other provinces as they may have different settings, management systems and provisions of service delivery. However, the research method could be used to gain further insight into the studied topic for midwives in other hospitals' labour units. Overall, the study gained valuable insights into the knowledge and practices of midwives regarding the utilization of CTG.

5.8 Conclusion

This study has explored and described the knowledge and practices of midwives regarding the utilization of CTG in labour. The participants were midwives allocated to labour units. They had 2 to 18 years of work experience and had some knowledge regarding the utilization of CTG.

The findings of knowledge and practices of midwives regarding the utilization of CTG include challenges such as shortage of material and human resources, lack of continuous training, which has a negative impact on the provision of midwifery care. Participants have outlined the need for additional midwives. New skilled midwives should be appointed to improve service delivery as there are staff shortages. A guaranteed supply and availability of CTG machines should be ensured. The nursing administration must ensure that there is adequate training for midwives, including in-service training, workshops and post basic advanced midwifery courses.

REFERENCES

- Alfirevic, Z., Devane, D. & Gyte, G.M., 2006. Continuous cardiotocography (CTG) as a form of electronic foetal monitoring (EFM) for foetal assessment during labour. *Cochrane Database Syst Rev*, 3(3).
- Allen, J., & Chudley, J., 2012. *Smashing UX design: Foundation for Designing Online User Experiences*. Chichester: John Wiley & Sons, Ltd.
- Altaf, S., Oppenheimer, C., Shaw, R., Waugh, J. & Dixon-Woods, M., 2006. Practices and views on foetal heart monitoring: a structured observation and interview study. *BJOG: An International Journal of Obstetrics & Gynaecology*, 113(4), pp.409-418.
- Aluttis, C., Bishaw, T. & Frank, M.W., 2014. The workforce for health in a globalized context-global shortage and international migration. *Global health action*, 7(1), p.23611.
- Armes, D., Engelhart, N., McKenzie, P. & Wiggers, P., 2015. *SIAM Principles and Practices for service integration and management*. Zaltbommel: Van Haren.
- Arora, K., 2015. *Research methods: The Essential Knowledge base*. Nelson Education. Boston: Cengage Learning.
- Ayanian, J.Z. & Markel, H., 2016. Donabedian's Lasting Framework for Health Care Quality. *The New England journal of medicine*, 375(3), p.205.
- Ayres-de-Campos, D., Spong, C.Y. & Chandrachan, E., 2015. FIGO consensus guidelines on intrapartum foetal monitoring: Cardiotocography. *International Journal of Gynecology & Obstetrics*, 131(1), pp.13-24.

Babbie, E., 2010. *The Practice of Social Research*. Wadsworth: Cengage Learning. *International Edition*.

Babbie, E. 2013. *The Practice of Social Research*. Wadsworth: Cengage Learning.

Babbie, E. & Mouton., J, 2011. *The practice of social research*. Cape Town: Thomson Learning Company.

Barnard, A., 2016. Radical nursing and the emergence of technique as healthcare technology. *Nursing Philosophy*, 17(1), pp.8-18.

Beckett, C. & Horner, N., 2015. *Essential Theory for Social Work Practice*. Londo: Sage.

Behruzi, R., Klam, S., Dehertog, M., Jimenez, V. & Hatem, M., 2017. *Understanding factors affecting collaboration between midwives and other health care professionals in a birth center and its affiliated Quebec hospital: a case study*. *BMC pregnancy and childbirth*, 17(1), p.200.

Bhogal, K., 2017. *Focus on cardiotocography: Intrapartum monitoring of uterine contractions*. *British Journal of Midwifery*, 25(8), pp.491-497.

Botman, Y., Greeff, M., Mulaudzi F.M. & Wright, S.C.D., 2010. *Research in health sciences*. Cape Town: Heinemann.

Botman, Y., Greeff, M., Mulaudzi F.M. & Wright, S.C.D., 2016. 6th Impression. *Research in health sciences*. Cape Town: Heinemann.

Brink, H., Van der Walt, C. & Van Rensburg, G., 2012. *Fundamentals of research methodology for health care professionals*. 3rd Edition. Cape Town: Juta and Company Ltd.

Brocklehurst, P., 2016. A study of an intelligent system to support decision making in the management of labour using the cardiotocograph—the INFANT study protocol. *BMC pregnancy and childbirth*, 16(1), p.10.

Brown, A.E., Bastian, L., Yasin, A., Dikshit, S., Grivell, R. & Yates, R., 2017. South Australian perinatal practice guidelines: foetal acid base balance assessment.

Burns, N. & Grove, S.K., 2010. *Understanding Nursing Research-eBook: Building an Evidence-Based Practice*. 5th edition. Missouri: Elsevier Health Sciences.

Butts, J.B. & Rich, K.L., 2017. *Philosophies and Theories for Advanced Nursing Practice*. 3rd edition. Massachusetts: Jones & Bartlett Publishers.

Castillo, J.J., 2009. Non-Probability Sampling. Retrieved from: <https://explorable.com/population-sampling> (Accessed 13 February 2019).

Chandrabaran, E. & Arulkumaran, S., 2007. Prevention of birth asphyxia: responding appropriately to cardiotocograph (CTG) traces. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 21(4), pp.609-624.

Chapman, V. & Charles, C. eds., 2018. *The midwife's labour and birth handbook*. London: John Wiley & Sons.

Chudáček, V., Andén, J., Mallat, S., Abry, P. & Doret, M., 2014. Scattering transform for intrapartum foetal heart rate variability fractal analysis: a case-control study. *IEEE Transactions on Biomedical Engineering*, 61(4), pp.1100-1108.

Conway, C.M. ed., 2014. *The Oxford handbook of qualitative research in American music education*. New York: Oxford University Press.

Council, S.A.N., 1984. Regulations relating to the scope of practice of persons who are registered or enrolled under the Nursing Act, 1978. *Regulation R, 2598*.

Creswell, J.W., 2013. *Research design: Qualitative, quantitative, and mixed methods approaches*. California: SAGE Publications.

Creswell, J.W. and Creswell, J.D., 2014. *Research design: Qualitative, quantitative, and mixed methods approaches*. California: SAGE Publications.

Denzin, N.K. & Lincoln, Y.S., 2011. *The Sage handbook of qualitative research*. 4th edition. California: SAGE Publications.

Department of Health. 2002. Government statistical service bulletin 11/200. NHS maternity statistics England: 1998/99 to 2000/2001. HMSO: London.

Department of Health. 2007. *Guideline for Maternity Care in South Africa: A Manual for clinics, Community Health Centers and District Hospital*. 3rd Edition. Pretoria: Government Printers.

Department of Health. 2015. *Guideline for maternity care in South Africa: a manual for clinics, community health centers and district hospital*. 4th Edition. Pretoria: Government Printers.

Devane, D. & Lalor, J., 2005. Midwives' visual interpretation of intrapartum cardiotocographs: intra-and inter-observer agreement. *Journal of advanced nursing*, 52(2), pp.133-141.

Devane, D. & Lalor, J.G., 2006. A randomised-controlled trial evaluating a foetal monitoring education programme. *Midwifery*, 22(4), pp.296-307.

Devane, D., Lalor, J.G., Daly, S., McGuire, W. & Smith, V., 2012. Cardiotocography versus intermittent auscultation of foetal heart on admission to labour ward for assessment of foetal wellbeing. *Cochrane Database Syst Rev*, 2.

De Vos, A.S., Strydom, H., Fouche, C.B. & Delport, C., 2011. *Research at Grass Roots: For Social Sciences and Human Service Professions*. 4th edition. Pretoria: Van Schaik.

Donabedian, A., 2005. Evaluating the quality of medical care. *The Milbank Quarterly*, 83(4), pp.691-729.

Duma, S., Dippenaar, J., Bhengu, B., Oosthuizen, A., Middleton, L., Phillips, M., Naude, S. & Uys, L., 2014. Specialist and advanced specialist nursing and midwifery practice. *Trends in Nursing*, 1(1), pp.102-119.

Du Preez, A., 2010. *Quality improvement intervention programme (QIIP) for intrapartum care* (Doctoral dissertation, North-West University).

Eglitis, D.S. and Chambliss, W.J., 2017. *Discover Sociology: Core Concepts*. 3rd edition. California: SAGE Publications.

Elo, S., Kääriäinen, M., Kanste, O., Pölkki, T., Utriainen, K. and Kyngäs, H., 2014. Qualitative content analysis: A focus on trustworthiness. *SAGE open*, 4(1), p.2158244014522633.

Fenton, B. & Mazulewicz, J., 2008. Trustworthiness. *Retrieved November 28*, p.2008.

Fox, M., Kilpatrick, S., King, T. & Parer, J.T., 2000. Foetal heart rate monitoring: interpretation and collaborative management. *Journal of Midwifery & Women's Health*, 45(6), pp.498-507.

Freeman, R.K., 2002. Problems with intrapartum foetal heart rate monitoring interpretation and patient management. *Obstetrics & Gynecology*, 100(4), pp.813-826.

Frodermann, L., 2018. *Exploratory Study on Circular Economy Approaches*. Springer Fachmedien Wiesbaden.

Ghaffari, F., Jahani Shourab, N., Jafarnejad, F. & Esmaily, H., 2014. Application of Donabedian quality-of-care framework to assess the outcomes of preconception care in urban health centers, Mashhad, Iran in 2012. *Journal of Midwifery and Reproductive Health*, 2(1), pp.50-59.

Grove, S.K., Burns, N. & Gray, J., 2012. *The practice of nursing research: Appraisal, synthesis, and generation of evidence*. Missouri: Elsevier Health Sciences.

Grove, S.K., Burns, N. and Gray, J., 2014. *Understanding Nursing Research: Building an Evidence-Based Practice*. 6th edition. Missouri: Elsevier Health Sciences.

Guest, G., Namey, E.E. & Mitchell, M.L. 2013. *Collecting Research Data: A Field Manual for Applied Research*. Los Angeles: SAGE Publications.

Harding, M., 2016. Cardiotocography can be used to monitor a baby's heart rate and a mother's contractions while the baby is in the uterus. <https://patient.info/pregnancy/cardiotocography> (Accessed 31 October 2019).

Hindley, C., Hinsliff, S.W. & Thomson, A.M., 2006. English midwives' views and experiences of intrapartum foetal heart rate monitoring in women at low obstetric risk: conflicts and compromises. *Journal of Midwifery & Women's Health*, 51(5), pp.354-360.

Hindley, C. & Thomson, A.M., 2007. Intrapartum foetal monitoring and the spectre of litigation: A qualitative study of midwives' views. *Clinical governance: an international journal*, 12(4), pp.233-243.

Holloway, I. & Galvin, K., 2016. *Qualitative research in nursing and healthcare*. New York: John Wiley & Sons.

Inman, P. & Robinson, D. eds., 2016. *University engagement and environmental sustainability*. Manchester: Oxford University Press

International Confederation of Midwives (ICM). 2014. International code of ethics for midwives.

http://CD2008_001%20V2014%20ENG%20International%20Code%20of%20Ethics%20for%20Midwives.pdf. (Accessed on 20 May 2017).

Jonsson, M., Lindeberg Nordén, S. & Hanson, U., 2007. Analysis of malpractice claims with a focus on oxytocin use in labour. *Acta obstetricia et gynecologica Scandinavica*, 86(3), pp.315-319.

Kumar, R., 2014. *Research methodology: A step-by-step guide for beginners*. 4th Edition. California: SAGE Publications.

Lawrence, E.R., Quarshie, E.L., Lewis, K.F., Peltzman, T. & Anderson, F.J., 2016. Introduction of cardiotocography monitoring improves birth outcomes in women with preeclampsia in Ghana.

Leon, A.C., Davis, L.L & Kraemer, H.C., 2011. The role and interpretation of pilot studies in clinical research. *Journal of psychiatric research*, 45(5), pp.626-629.

List of municipalities in Limpopo

https://en.wikipedia.org/wiki/List_of_municipalities_in_Limpopo (Accessed 13 April 2019)

Mangal, S.K. & Mangal, S., 2013. *Research methodology in behavioural sciences*. Genre: PHI Learning Press.

Mishra, M.G. & Sinha, H.H., 2014. The treatment and Prognosis in Obsterics & Gynecology. New Delhi, India: JP Medical Ltd.

McKevitt, S., Gillen, P. & Sinclair, M., 2011. Midwives' and doctors' attitudes towards the use of the cardiotocograph machine. *Midwifery*, 27(6), pp. 279-285.

McMillan, J.H. & Schumacher, S., 2010. Research in Education: Evidence-Based Inquiry, MyEducationLab Series. *Pearson*.

Meleis, A., 2005. The discipline of nursing: A perspective, a domain, and definitions. *Theoretical nursing development and progress*. Philadelphia: Lippincott Williams & Wilkins.

Mhlongo, N.M., 2016. *Experiences of midwives regarding practice breakdown in maternity units at a public hospital in KwaZulu-Natal* (Doctoral dissertation).

Mokoka, K.E., Ehlers, V.J. & Oosthuizen, M.J., 2011. Factors influencing the retention of registered nurses in the Gauteng Province of South Africa. *Curationis*, 34(1), pp.1-9.

Moore, L., Lavoie, A., Bourgeois, G. & Lapointe, J., 2015. Donabedian's structureprocess-outcome quality of care model: Validation in an integrated trauma system. *Journal of Trauma and Acute Care Surgery*, 78(6), pp.1168-1175.

Moyimane, M.B., Matlala, S.F. & Kekana, M.P., 2017. Experiences of nurses on the critical shortage of medical equipment at a rural district hospital in South Africa: a qualitative study. *Pan African Medical Journal*, 28(1), p.157.

Ntuli, S.T. & Ogunbanjo, G.A., 2014. Midwifery workforce profile in Limpopo Province referral hospitals. *African journal of primary health care & family medicine*, 6(1), pp.1-4.

Olewi, S., 2018. Effectiveness of an Education Program Concerning Cardiotocography on Nurses-Midwives' Practice in Maternity Hospitals at Baghdad City. *Iraqi National Journal of Nursing Specialties*, 1(31), pp.24-34.

O'Sullivan, E., Berner, M., Taliaferro, J.D. and Rassel, G.R., 2016. *Research methods for public administrators*. New York: Routledge.

Panesar, S., Carson-Stevens, A., Salvilla, S. & Sheikh, A., 2014. *Patient safety and healthcare improvement at a glance*. United States: John Wiley & Sons.

Pannucci, C.J. & Wilkins, E.G., 2010. Identifying and avoiding bias in research. *Plastic and reconstructive surgery*, 126(2), p.619.

Parhizkar, S., Latiff, L.A. and Aman, N.B., 2012. Midwifery Nurses' Skill to Interpret Cardiotocogram: A Cross Sectional Study. *International journal of health, science and research*, pp.1-34.

Patino, C.M. & Ferreira, J.C., 2018. Inclusion and exclusion criteria in research studies: definitions and why they matter. *Jornal Brasileiro de Pneumologia*, 44(2), pp.84-84.

Pearson, L., Larsson, M., Fauveau, V. & Standley, J., 2007. Childbirth care. *World Health Organization: opportunities for Africa's newborns: practical data, policy and programmatic support for newborn care in Africa*. Geneva: WHO.

Pehrson, C., Sorensen, J.L. & Amer-Wåhlin, I., 2011. Evaluation and impact of cardiotocography training programmes: a systematic review. *BJOG: An International Journal of Obstetrics & Gynaecology*, 118(8), pp.926-935.

Pettker, C.M. & Campbell, K.H., 2018. Antepartum Foetal Assessment. In *Avery's Diseases of the Newborn*. 10th Edition. pp. 145-157.

Pinas, A. & Chandraharan, E., 2016. Continuous cardiotocography during labour: Analysis, classification and management. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 30, pp.33-47.

Polit, D.F. & Beck, C.T., 2008. *Nursing research: Generating and assessing evidence for nursing practice*. 8th Edition. Philadelphia: Lippincott Williams & Wilkins.

Polit, D.F. & Beck, C.T., 2012. *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. Philadelphia: Lippincott Williams & Wilkins.

Polit, D.F. & Beck, C.T., 2017. *Nursing research: Generating and assessing evidence for nursing practice*. 10th Edition. Philadelphia: Lippincott Williams & Wilkins.

Redman, C.W.G. & Moulden, M., 2014. Avoiding CTG misinterpretation: A review of the latest Dawes-Redman CTG analysis. *British Journal of Midwifery*, 22(1), pp.2-5.

Rowley, J. & Slack, F., 2004. Conducting a literature review. *Management research news*, 27(6), pp.31-39.

Salkind, N.J., 2010. *Encyclopedia of research design* (Vol.1). California: SAGE Publications.

Sandelowski, M., 2000. Retrofitting technology to nursing: the case of electronic foetal monitoring. *Journal of Obstetric, Gynecologic, & Neonatal Nursing*, 29(3), pp.316-324.

Schmidt, N. A. & Brown, J.M., 2014. *Evidence-based practice for nurses: Appraisal and application of research*. Sudbury, MA: Jones & Barlett Learning.

Shaw, S. & Barrett, G., 2006. Research governance: regulating risk and reducing harm? *Journal of the Royal Society of Medicine*, 99(1), pp.14-19.

Signorini, M.G., Fanelli, A. & Magenes, G., 2014. Monitoring foetal heart rate during pregnancy: contributions from advanced signal processing and wearable technology. *Computational and mathematical methods in medicine*.

Sinclair, M., 2001. Midwives' attitudes to the use of the cardiotocography machine. *Journal of advanced nursing*, 35(4), pp.599-606.

Smith, V., Begley, C.M., Clarke, M. & Devane, D., 2012. Professionals' views of foetal monitoring during labour: a systematic review and thematic analysis. *BMC pregnancy and childbirth*, 12(1), p.166.

South Africa Nursing Council.1978. Nursing Act, 1978. Act No. 50, 1978, (as amended). Pretoria: Government Printers.

Steer, P.J., 2008. February Has electronic foetal heart rate monitoring made a difference? In *Seminars in Foetal and Neonatal Medicine* (Vol. 13, No 1, pp. 2–7). Elsevier.

Strang, K. ed., 2015. *The Palgrave handbook of research design in business and management*. Springer.

Strong Jr, T.H. & Jarles, D.L., 1993. Intrapartum auscultation of the foetal heart rate. *American journal of obstetrics and gynecology*, 168(3), pp.935-936.

Stufflebeam, D. L. & Coryn, C. L., 2014. *Evaluation theory, models, and applications*. (Vol. 50). John Wiley & Sons.

Stton, J. & Austin, Z., 2015. Qualitative research: data collection, analysis, and management. *The Canadian journal of hospital pharmacy*, 68(3), p.226.

Swanson, R.A., & Chermack, T.J., 2013. *Theory building in applied disciplines*. San Francisco, CA: Berrett-Koehler.

Tappen, R.M., 2011. *Advanced Nursing Research: From Theory to Practice*. Sudbury: Jones & Bartlett Learning.

Terry, A., 2012. *Clinical research for the Doctor of Nursing Practice*. Sudbury: Jones & Bartlett Learning.

Thellesen, L., Sorensen, J.L., Hedegaard, M., Rosthoej, S., Colov, N.P., Andersen, K.S. & Bergholt, T., 2017. Cardiocography interpretation skills and the association with size of maternity unit, years of obstetric work experience and healthcare professional background: a national cross-sectional study. *Acta obstetricia et gynecologica Scandinavica*, 96(9), pp.1075-1083.

Thopola, M.K. & Lekhuleni, M.E., 2015. Challenges experienced by midwifery practitioners in the midwifery practice environment of Limpopo Province, South Africa: maternal and child care. *African Journal for Physical Health Education, Recreation and Dance*, 21(Supplement 1), pp.498-513.

Tities, P.L., 2012. *Midwives' knowledge and ability in interpreting foetal heart rate patterns in Cape Town in the Western Cape Province of South Africa* (Doctoral dissertation, University of Western Cape).

Van der Pijl, M.S.G., Groenestege, E.T. and Verhoeven, C.J.M., 2019. Experiences and views of midwives performing antenatal cardiocography in Dutch primary care: a qualitative study. *Midwifery*.

Voyce, J., Gouveia, M.J., Medinas, M.A., Santos, A.S. & Ferreira, R.F., 2015. A Donabedian Model of the Quality of Nursing Care from Nurses' Perspectives in a Portuguese Hospital: A Pilot Study. *Journal of nursing measurement*, 23(3), pp.474-484.

Westerhuis, M., Kwee, A., van Ginkel, A., Drogdrop, A., Gyselaers, W. & Vissera, G., 2007. Limitations of ST analysis in clinical practice: three cases of intrapartum metabolic acidosis. *BJOG: An International Journal of Obstetrics and Gynaecology*.114:1194–1201.

Williams, B. & Arulkumaran, S., 2004. Cardiotocography and medicolegal issues. *Best Practice & Research Clinical Obstetrics & Gynaecology*, 18(3), pp.457-466.

Williamson, G.R. & Whittaker, A., 2017. *Succeeding in literature reviews and research project plans for nursing students*. 3rd Edition. United Kingdom: Learning Matters.

UNICEF. 2008. *The state of the world's children 2009: maternal and newborn health* (Vol. 9). Unicef.

Zungu, W.S., 2016. *Exploring the role of community trusts in development within the Mkhwanazi Traditional Authority* (Doctoral dissertation).

APPENDIX A

APPROVAL LETTER FROM TURFLOOP RESEARCH AND ETHICS COMMITTEE



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 4029, Fax: (015) 268 2306, Email: Abdul.Maluleke@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE CLEARANCE CERTIFICATE

MEETING: 02 November 2017

PROJECT NUMBER: TREC/374/2017: PG

PROJECT:

Title: Knowledge and practices of midwives regarding the utilization of cardiotocography in labour units at Mokopane and Voortrekker Hospitals, Waterberg District in Limpopo Province


Researcher: RR Mazwi

Supervisor: Dr MK Thopola

Co-Supervisor: Prof ME Lekhuleni

School: School of Health Care Sciences

Degree: Masters in Nursing Science


PROF TAB MASHEGO
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) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee.
- ii) The budget for the research will be considered separately from the protocol.
PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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APPENDIX B

APPROVAL LETTER FROM LIMPOPO DEPARTMENT OF HEALTH



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

Enquiries: Stols M.L (015 283 6168)

Ref:4/2/2

Mazwi R.R
University of Limpopo
Private Bag X 1106
Sovenga
0727


Greetings,

RE: Knowledge and Practices of Midwives Regarding the Utilization of Cardiotocography in Labour Units at Mokopane and Voortrekker Hospitals, Waterberg District in Limpopo Province.

The above matter refers.

1. Permission to conduct the above mentioned study is hereby granted.
2. Kindly be informed that:-
 - Research must be loaded on the NHRD site (<http://nhrd.hat.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.
 - 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 3 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

11/12/2017
Date

18 Chicago Street, Polokwane, 0700, Private Bag 9902, POLOKWANE, 0700
Tel: (015) 283 8000, Fax: (015) 283 8211/20 Website: <http://www.limpopo.gov.za>

APPENDIX C
APPROVAL LETTER FROM WATERBERG DISTRICT



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)
DATE: 30/01/2018
TEL NO: 014. 718 0623
E-MAIL: David.Nkgodi@dhsd.limpopo.gov.za

TO: MAZWI R.R.
UNIVERSITY OF LIMPOPO
PRIVATE BAG X 1106
SOVENGA
0727

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 Knowledge and practices of Midwives regarding the utilization of Cardiotocography in Labour Units at Mokokwane and Voortrekker Hospitals, Waterberg District in Limpopo Province, South Africa.
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.



DISTRICT EXECUTIVE MANAGER
WATERBERG DISTRICT

30/01/2018
DATE

APPENDIX D

APPROVAL LETTER TO CONDUCT A STUDY FROM MOKOPANE HOSPITAL



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA
DEPARTMENT OF HEALTH
WATERBERG DISTRICT
MOKOPANE REGIONAL HOSPITAL

✉ : Ms. Manaka J.M
☎ : (015) 483 4174
☎ : (015) 483 2405

Date: 29 May 2018

University of Limpopo
P/Bag X 1106
SOVENGA
0727

Greetings,

RE: PERMISSION TO CONDUCT RESEARCH STUDY.

1. This serves to confirm that Researcher - Ms. Mazwi R.R was granted permission to conduct research in our institution. She conducted the research in Maternity ward under the supervision of Acting Area Manager.
2. She further collects information from Professional nurses in the maternity units.

Hope you find the above in order.


Ms. Manaka J.M
Acting Deputy Manager Nursing



Mokopane Regional Hospital Private Bag 22466 Mokopane.
0600 Tel (015) 483 4000 Fax (015) 483 2405



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APPENDIX E

CONSENT FORM

DEPARTMENT OF NURSING SCIENCE ENGLISH CONSENT FORM

Statement concerning participation in Clinical Research Project.

Name of study: Knowledge and practices of midwives regarding the utilization of cardiotocography in labour units at Mokopane and Voortrekker Hospitals, Waterberg District in Limpopo Province.

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

I know that sound recordings will be taken of me. I am aware that this material may be used in scientific publications which will be electronically available throughout the world. I consent to this, provided that my name and hospital number are 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. This will have no influence on the regular treatment that holds for my condition neither will it influence the care that I receive from my regular doctor.

I know that this study has been approved by the Turfloop Research Ethics Committee (TREC). 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.

The study envisaged may hold some risk for me that cannot be foreseen at this stage.

Access to the records that pertain to my participation in the study will be restricted to persons directly involved in the research.

Any questions that I may have regarding the research, or related matters, will be answered by the researcher/s.

If any medical problem is identified at any stage during the research, or when I am vetted for participation, such condition will be discussed with me in confidence by a qualified person and/or I will be referred to my doctor.

I indemnify the University of Limpopo and all persons involved with the above project from any liability that may arise from my participation in the above project or that may be related to it, for whatever reasons, including negligence on the part of the mentioned persons.

I hereby give consent to participate in this study.

Signature of researched person.....

Signature of researcher.....

Signed at.....this.....day of.....20

Contact No:

APPENDIX F

INTERVIEW GUIDE Introduction

- The researcher will greet and welcome all participants.
- The researcher will then briefly introduce herself to the participants.
- She will explain her purpose in coming to the institution, as well as outlining the purpose, objective and the significance of the study to the participants. In addition, she will explain what is expected of the participant during the interview sessions.
- She will explain the purpose of the voice recorder to the participants.
- She will explain anonymity and confidentiality and the use of codes instead of participants' names.
- Participants who agree to participate in the study will be given a consent form to sign.

The interview questions Central question

- Could you please describe your knowledge and practice as a midwife regarding the utilization of CTG monitor during labour?

Probing questions

- What measures could be taken in order to ensure safe practice when utilising CTG machines during labour?
- How many machines are currently working?
- Have you received any training regarding the utilization of CTG?
- Does technology play a huge role in health?
- Explain your own views regarding the utilisation of CTG during labour.
- Which patients do you put on CTG?
- Do you use the CTG under doctor's order or on prescription?
- What is your understanding regarding the utilization of CTG and the results thereof?

APPENDIX G

EXAMPLE OF A CONDUCTED INTERVIEW TRANSCRIPTION

Interviewer: Researcher **Interviewee:** Participant **Interview number:** 01

Interview setting: the interviews were conducted in the hospital units, during the day.

(Start of interview)

Interviewer: Good morning.

Interviewee: Morning.

Interviewer: My name is Mazwi Ruth; I am a masters' student from the University of Limpopo doing Master of Nursing Science. I am here to conduct a study about knowledge and practice of midwives regarding the utilisation of cardiotocography in labour units. The purpose of my visit here is that I am requiring information about knowledge and practices of midwives regarding the utilization of cardiotocography. I explained earlier the purpose, objectives and the significance of the study. I would like to remind you again that I am going to use a voice recorder to capture everything at the same time as I am writing, to serve as a true record that I did not fake the information you gave me. This information will remain between me and my supervisor for referral. I will not use user true identification to protect your identity and for privacy. **Interviewer:** Before we start, I would like to confirm that you have read and understood the consent form before you sign.

Interviewee: Yes, I understood.

Interviewer: That you understand that your participation in the study is entirely voluntary and that you can withdraw from the study at any time?

Interviewee: Yes, I did.

Interviewer: Do you have any question before we proceed?

Interviewee: No.

Central question

Interviewer: Could you please describe your knowledge as a midwife regarding the utilisation of CTG monitor during labour?

Interviewee: Do you want me to give the definition of the CTG or what?

Interviewer: Yes, you can even do that, but basically asking about your knowledge regarding the utilization of CTG.

Interviewee: Is a machine that monitors the foetal heart and assisting us to see any.....!!! It assists us in detecting foetal distress, variability if they are ok. When the woman is not in labour we put them on the machine to detect the variability's or if there are any decelerations. But firstly, it can help use to detect if the foetal heart is present and secondly if the foetal heart is normal and if is within the normal ranges and the baseline. If there are any decelerations we can be able to take relevant actions.

Probing questions

Interviewer: What measures could be taken in order to ensure safe practice when utilizing CTG during labour? How many machines are currently working?

Interviewee: Currently we have four machines that are working, but the other one it doesn't have toco.

Interviewer: But initially it had one?

Interviewee: Yes, it is old and broken.

Interviewer: Ok, so to ensure a safe practice when using these CTGs, what can be done?

Interviewee: To make sure that we as midwives we take care of our equipments it is very much important for it to last and if we don't take care of it, they will be damaged and eventually they will end up not working like now when the toco is not working.

Interviewer: Did you receive the four machines at the same time?

Interviewee: No, they did not come simultaneously the other once we received them late last year around October- November

Interviewer: How many did you have before there were four?

Interviewee: We only had two

Interviewer: Explain your own views regarding the utilization of CTG during labour? Do you see them as something useful or just a waste of time?

Interviewee: No. They are very useful because we can detect early if the foetus has a problem. I think if we were not having them we would have had many intra-uterine deaths and because the fetoscope is just to hear the heart beat only and times we cannot detect any change.

Interviewer: In most cases do you understand the tracing part of it?

Interviewee: Yes, we do understand.

Interviewer: How is your level of understanding regarding the interpretation trace?

Interviewee: On my side, I do understand them as I am an advanced midwife.

Interviewer: Do you receive any training or in-services regarding the utilisations of CTGs?

Interviewee: Yes, we do in-services in the unit, but I have never received any formal training regarding the CTG, apart from when I was at school.

Interviewer: Since you said you currently have one machine that is not functional. Where do you report such cases?

Interviewee: Here in the unit but we firstly report them where they come from. At times they do come and service them, even though they take time as they are expensive, and you know that it is a procedure that require lot of money but currently we just use the once that are on good condition.

Interviewer: On which patients do you use the CTG?

Interviewee: Every patient on admission we put them on CTG and also those in labour, high risk patients, patients on induction of labour. High risk patients when they are in ANC we put them on CTG BD. As you know that when a woman is in labour we do continuous CTG with a trace strip but with high risk we just check without tracing strip for a minute or 2 minutes. In our unit we sometimes have a challenge of not having paper traces hence at times we just check without tracing.

Interviewer: I heard you mention high risk patients; do you only focus on high risk patients? And the reason for not tracing using a paper trace?

Interviewee: Not necessarily, when you see that this patient has a problem you can put them once a day. We also put patients who are not in labour as well; because it can happen that the foetal heart can stop for some reasons. We also have a challenge of not having papers to trace and it becomes a challenge if we have high risk patients, so we don't trace all patients on the paper strip

Interviewer: When utilizing these CTGs do you at times encounter challenges of getting wrong readings

Interviewee: Sometimes they do, more especially when the foetal heart is not there, and you will find that it is a maternal pulse instead of foetal heart. But it is rare because the doctors confirm with the use of sonar in most cases.

Interviewer: In the case where it gives wrong readings, doesn't it mislead you to take the patient to theatre?

Interviewee: No, it doesn't because the doctors confirm with sonar before.

Interviewer: Any questions so far that you would like to ask?

Interviewee: No.

Interviewer: According to your own views, does technology plays a huge role in health? And How?

Interviewee: Yes, a lot. It saves time and most problems we can detect them unlike when we use foetal stethoscope, and we are able to check four patients at a time by putting them on the CTG unlike when using a foetal stethoscope because you have to do them one by one.

Interviewer: Ok, what guides you to use the CTG on patients?

Interviewee: We depend on the maternal guideline on how to manage patients e.g. when to put them and how long.

Interviewer: Ok this is the end of our interview, thanks for your time and participation.

APPENDIX H
LETTER FROM INDEPENDENT CODER

QUALITATIVE DATA ANALYSIS

MASTER IN NURSING SCIENCE

RUTH RAESETJA MAZWI

THIS IS TO CERTIFY THAT

Professor Martha Nozizwe Jali has co-coded 18 semi-structured in-depth interviews from midwives

For the study:

**KNOWLEDGE AND PRACTICES OF MIDWIVES REGARDING THE UTILIZATION OF
CARDIOTOCOGRAPHY IN LABOUR UNITS AT MOKOPANE AND VOORTREKKER
HOSPITALS, WATERBERG DISTRICT IN LIMPOPO PROVINCE**

I declare that the candidate and I have reached consensus on the major themes reflected by the data during a consensus discussion. I further declare that data saturation was reached as evidenced by repeating themes



Prof M.N. Jali

APPENDIX I
CONFIRMATION FROM LANGUAGE EDITOR

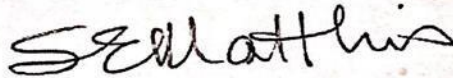
Sue Matthis B A (Hons) 1 Oden Place Douglasdale, 2191	Cell: 0837817646 e-mail:suematthis@gmail.com
---	---

TO WHOM IT MAY CONCERN

This serves as confirmation that I have proofread and language edited the dissertation:

THE KNOWLEDGE AND PRACTICE OF MIDWIVES REGARDING THE UTILISATION OF
CARDIOTOCOGRAPHY IN LABOUR UNITS IN THE MOKOPANE AND VOORTREKKER HOSPITALS,
WATERBERG DISTRICT, LIMPOPO PROVINCE.

By Miss Mazwi R.R. submitted in fulfilment of the requirements for the degree of
MASTER OF NURSING SCIENCE.



S E Matthis

20 April 2019