Experiences of medical practitioners regarding the accessing of information at the point-of-care via mobile technology for clinical decision making at public hospitals

by

Annesty Elaine Van Rooyen

Submitted in fulfilment of the requirements for the degree

Master of Nursing (Research)

in the

Faculty of Health Sciences

at the

Nelson Mandela Metropolitan University

SUPERVISOR: Prof E. Ricks

CO-SUPERVISOR: Prof P. Jordan

2016

DECLARATION

DEPARTMENT OF ACADEMIC ADMINISTRATION
EXAMINATION SECTION
SUMMERSTARND NORTH CAMPUS
PO Box 77000
Nelson Mandela Metropolitan University
Port Elizabeth
6013

Enquiries: Postgraduate Examination Officer

Nelson Mandela
Metropolitan
University

for tomorrow

DECLARATION BY CANDIDATE

NAME: _____ Annesty Elaine Van Rooyen _____

STUDENT NUMBER: _____ 212429930 _____

QUALIFICATION: _____ Master Curationis _____

TITLE OF PROJECT: _____ Experiences of medical practitioners regarding the accessing of _____ information at the point-of-care via mobile technology for clinical decision making at public hospitals.

DECLARATION:

In accordance with Rule G5.6.3, I hereby declare that the above-mentioned treatise/ dissertation/ thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

SIGNATURE: _____

DATE: _____ 29 December 2015 _____

ACKNOWLEDGEMENTS

I wish to express my sincere gratitude to the following people:

- My heavenly Father, for giving me the strength and courage to complete my study.

- Prof. E. Ricks and Prof. P. Jordan for their assistance and on-going encouragement in completion of this task.

- My husband, Harry, for your understanding, love and support during my studies. Without your assistance, I would never have been able to complete my studies.

- My sons with their wives; Stephen and Jezerelle, Owen-Paul and Cindy, thank you so much for your patients and for granting me precious family time to work on this research and always believing in me.

- All the participants who were willing to share their experiences with me.

- All my colleagues at work for their encouragement and continuous support.

DEDICATION

This Dissertation is dedicated to:

My late mother and father, Mary and Henry Du Plessis,

for their teaching of love and

who has shown me that through

hard work, perseverance and discipline that

the sky is not the limit.

Abstract

Medical practitioners are often unable to access medical and health information at the point-of-care, thus preventing them from providing quality healthcare. Family Health International 360 (FHI) provided medical practitioners with a locally relevant, reliable, and accurate comprehensive library of medical information on mobile computing devices (MCDs), at the point-of-care, as part of a project in collaboration with the Department of Health in the Eastern Cape Province. As part of the latter project, Ricks (2012:7) conducted an investigation into the impact that accessing health information at the point-of-care, via MCDs, had on the clinical decision-making practice of medical practitioners and professional nurses in public hospitals and primary healthcare settings in the Eastern Cape Province. The researcher identified a gap in the aforementioned study and was thus motivated to conduct this study to explore and describe the experiences of medical practitioners at public hospitals in further detail by conducting a qualitative study, as the previous study was quantitative. The purpose of this study was therefore to explore and describe the experiences of medical practitioners regarding the accessing of information at the point-of-care, via mobile technology, for clinical decision making at public hospitals.

To achieve the purpose of the study, a qualitative, explorative, descriptive and contextual research design was used. The research population comprised medical practitioners who were using MCDs to access information at the point-of-care for clinical decision making. Purposive sampling was used to select the research sample. Semi-structured interviews were used to collect the necessary research data. Tesch's steps were used to analyse the data. The principles for ensuring trustworthiness and ethical considerations were adhered to throughout the study.

Two main themes and six sub-themes emerged in relation to the experiences of medical practitioners regarding the accessing of information at the point-of-care, for clinical decision making, via mobile technology. The main findings of the research highlighted the benefits and challenges that were experienced by the medical practitioners when using the MCDs for accessing information at the point-of-care for clinical decision making.

The study concludes with recommendations pertaining to the areas of practise, education and research.

TABLE OF CONTENTS

CHAPTER ONE

OVERVIEW OF THE STUDY

CHAPTER TWO

RESEARCH DESIGN AND METHOD

CHAPTER THREE

DATA ANALYSIS AND DISCUSSION

CHAPTER FOUR

SUMMARY, CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

LIST OF ANNEXURES

LIST OF TABLE

CHAPTER ONE
OVERVIEW OF THE STUDY

1.1 INTRODUCTION

The norms and standards laid down for medical practitioners stipulate that they must act in the best interests of their patients at all times. Therefore, effective clinical decisions must be made in order to ensure the best outcomes for their patients (Aston, Wakefield & McGown, 2010:15). According to Standing (2010:1), clinical decision making is an informed opinion, using intuition, reflection and critical thinking that relates to the observation and assessment of patients, in order to identify and evaluate alternative options. In addition, clinical decision making is a cognitive process whereby a decision is reached, the positive and the negatives of each option weighed up, and a choice is made between different alternatives for that particular situation (Standing, 2010:6). In other words, medical practitioners constantly need to make clinical decisions at the point-of-care in a wide variety of circumstances, in order to respond to patients' problems. According to Soltani (2009:1), medical practitioners use their professional knowledge and skills to make a decision based on evidence for best practice. By finding the best available evidence to help solve patients' problems and make decisions about their care, medical practitioners will facilitate the translation of knowledge into practice at the point-of-care.

According to Lasserre, Eley, Baker & Kruesi (2010:87), the best option for medical practitioners to obtain answers to health related questions, which arise during clinical encounters with patients, would be to have access to information at the point-of-care. Furthermore, Chan & Stiedat (2010:51) state that point-of-care could include being at the patient's bedside or in the doctor's office. However, Stroud, Smith & Erkel (2009:31) point out that the main challenge and limitation for busy medical practitioners is accessing reliable information that is current and already related to everyday practice from a real-time information system.

To conquer this challenge, real-time information systems have become available with the advent of mobile technology, such as smartphones, tablets and personal digital assistants, to provide medical practitioners with reliable information at the

point-of-care. Indeed, Crowe (2010:456) points out that the portability of the device makes it possible for medical practitioners to use it at the point-of-care as an information management tool by which to access mobile resource services and medical libraries.

Most of the point-of-care resources required by medical practitioners are available electronically via the intranet and internet, and could be accessed via mobile technology (Lasserre *et al.,* 2010:87). Point-of-care resources are decision-support tools that are aimed at supporting medical practitioners' decision making at the point-of-care. Furthermore, point-of-care resources are interactive, flexible and adaptable computer-based information systems. According to Di Pietro, Doran & McArthur (2010:236), point-of-care resources are designed to analyse data, support problem solving and assist healthcare providers to make clinical decisions at the point-of-care. Currently, different point-of-care resources are often available on various mobile devices, for example, smart phones, iPads, Tablets, pocket personal computers, calculators, Personal Digital Assistants (PDAs), electronic dictionaries and textbooks (Granic, Cukusic, & Walker, 2009:168).

The literature cited above provides evidence that point-of-care resources support problem solving at the point-of-care. Medical practitioners often experience problems related to accessing information regarding medicine safety and dosing. Similarly, medication information is often poorly delineated for patients in clinical settings and becomes a threat for medication errors. Accessing information via mobile technology at the point-of-care is one strategy that assists in the prevention of medication errors at the point-of-care (Calabretto, Thomas, Rossi, & Beilby, 2014:2). Additionally, the mobility of technology at the point-of-care enables medical practitioners to access medicine information anywhere and at any time, in a variety of situations (Granic *et al.,* 2012:168). For this reason, mobile technology directly assists with addressing the issue of medication information dissemination and its value is further enhanced by the availability of information at the point-of-care (Lazzara & Weaver, 2011:731).

On the basis of this evidence, it appears to be confirmable that mobile technology is useful for assessing information at point-of-care and could therefore contribute to medication safety at the point-of-care. According to Benavides, Polen, Goncz & Clauson (2011:40), a growing number of healthcare professionals (HCP), paediatricians (80%) and paediatric residents (89%) have used mobile technology to access information on paediatric medicine in the United States of America. Furthermore, mobile technology aids in predicting potential events, which can range from drug interaction to disease symptoms, when searching for information at the point-of-care (Granic *et al.,* 2009:168).

There is considerable evidence to support the notion that mobile technology has been adopted by medical practitioners at the point-of-care to access health related information for clinical decision making. In a research conducted by Dee, Teolis & Todd (2005:480-486) on the use of mobile technology for clinical decision making, among 108 physicians, the following has been concluded: 55% of the physicians use mobile technology for accessing information before, during, or after patient encounters, and, 67% indicated that using mobile technology for accessing information influenced their decision making at the point-of-care. Another study conducted by Stroud *et al.,* (2009:35), in the United States, on mobile technology users confirmed that the majority of the participants perceived the use of mobile technology to provide improved access to information, and it increased productivity by 75%, promoted patient safety by 89%, reduced medical errors by 4%, supported decision making by 91%, and offered health related solutions at the point-of-care. It can therefore be concluded that accessing information via mobile technology at the point-of-care increases the efficiency of medical practitioners with regard to clinical decision making in managing patients' health related problems.

Therefore, in order to increase the efficiency of clinical decision making by medical practitioners, resources are needed at the point-of-care. According to Johnson (2008:16), the resources most frequently used for clinical decision making by medical practitioners at the point-of-care are drug reference databases, clinical calculators to assist in the calculation of intravenous drip rates or weight-based dosing for medication administration, medical dictionaries, clinical reference manuals, and guidelines information. In addition, mobile technology is also used by

medical practitioners for charting and beaming medication orders to pharmacies. A key point identified in a study of the impact of hand-held computers on patient care, in the United States, was the speed at which information for clinical decision making can be delivered via mobile technology (Honeybourne, Sutton & Ward*, 2006:52*).

Mobile technology has been widely adopted in clinical practice for providing access to information. According to Boruff & Bilodeau (2012:56), in comparison to other academic disciplines, medicine has been an early adopter in the use of mobile devices; this trend continues today, with medical libraries providing information for clinical decision making.

The use of mobile technology by medical practitioners to access information for clinical decision making was confirmed by a research conducted by MaxMD & Schiavo (2006), as cited in Higgins, Sixsmith, Barry & Domegan (2011:7), who indicated that physicians in the United States spend at least 50 minutes per night online searching for disease and drug information and, to a lesser degree, continuing medical educational information. This finding was supported by a study conducted in Missouri by De Leo, LeRouge, Ceraini & Niederman (2006:902) which indicated that 92% of the 381 physicians surveyed browsed Google on-site as well as portals such as WebMD, PubMed and Medline for healthcare information to assist in clinical decision making at the point-of-care (Higgins *et al.,* 2011:7).

The World Health Organization (WHO) believes that accessing information via mobile technology holds great promise for improving health and healthcare and is critical to the achievement of the Millennium Development Goals (Abbott & Coenen, 2008:239). Therefore, the value of mobile technology is not only to manage and distribute information to impact health, improve efficiency and demonstrate contribution to outcome, but also to offer knowledge and communication lifelines to isolated providers, patients, and caregivers around the globe. Indeed, Abbott & Coenen (2008:238) state that mobile technology lessens the impact of geographical distances by assisting in accessing information for clinical decision making which, in turn, increases the quality of healthcare offered by medical practitioners.

Similarly, communication barriers resulting from geographical distance are removed by using mobile technology which makes it possible for anyone, anywhere, to communicate. As is evident in a study conducted by Govindasamy (2012:76) in Kwazulu-Natal, on the identification of hotspots and mobile technology, fixed and mobile technology is an efficient way of connecting with a large portion of the population in order to reach remote and underdeveloped areas and enable the users to share information. As a result, mobile technology potentially reaches a larger number of referring medical practitioners in close contact with their colleagues when they need assistance in decision making at the point-of-care (Minges, Gray, Magpantay, Kelly, Reynolds, Mukim, Schorr & Goodrick, 2003:59).

The benefit of reaching large numbers of medical practitioners and patients with the assistance of computerised health information systems is the ability to improve the treatment of patients, provide up-to-date information on policies, and improve decision making at the point-of-care (Ruxwane, Nkqubela, Herselman & Conradie, 2010:27). Assistance for better clinical decision making by medical practitioners is made possible by E-Health projects which have the capability of improving the quality of service delivery. E-Health projects include a patient record system, giving medical practitioners a better view of the medication that has been prescribed and dispensed to the patient who, over time, will help support better clinical decision making and enhance patient health outcomes. Furthermore, the calculation of gestational age as well as body mass index in pregnant mothers, as a result of the use of mobile technology, is made possible. The real-time sound analyser that can create and save images of heart sounds also contributes to effective clinical decision making at the point-of-care (Classen, Resar, Graffin, Federico, Frankel, Kimmel, Whittington, Frankel, Seger, & James, 2011:1391).

Patients also play an active role in decision making regarding their healthcare and have the right to be involved in their healthcare planning throughout the disease process. A higher level of patient involvement will most likely result in better quality of care, increase satisfaction and improve patients' and caregivers' psychological well-being and overall wellness (Jones, Schilling & Pesut, 2011:25). In a cross-sectional survey conducted on health information seeking behaviour by the health

consumer, it was determined that 80% of physicians reported that patient's present printed internet-soured health information at their visits to healthcare institutions (Higgins *et al.,* 2011:1). Hence, both international and national healthcare is a result of teams, including the patient, family members and multidisciplinary team, and is dependent on the contribution of information and knowledge for clinical decision making (Edwards & Elwyn, 2009:4).

The facilitation of effective patient decision making is dependent on the contribution of information via mobile technology. For this reason, mobile technology can indeed facilitate the process of accessing information for clinical decision making (Stroud *et al.,* 2009:35; Di Pietro *et al.,* 2010:236). Clinical decision support tools have been developed to deliver information in a timely manner at the point-of-care. It is highlighted in a research conducted by Williams & Dittmer (2009:224) that 84.6% of the participants suggested that handheld devices should be recommended to hospital medical staff and used in clinical practice. Wilson (2012:7) highlights the significance of accessing information via mobile technology to improve and enhance the safety, efficiency of quality of the patient care rendered, and good patient outcomes in real time.

A study was conducted by Ricks (2012:7) to investigate the impact of accessing health information at the point-of-care via MCDs on the clinical decision making practice of medical practitioners and professional nurses in public hospitals and primary healthcare settings in the Eastern Cape Province. A sample of 62 medical practitioners and 63 registered nurses participated in the study. Each participant was issued with a mobile computing device pre-loaded with various books and sources of information that could easily be accessed at the point-of-care when needed for clinical decision making. The research results revealed that both the medical practitioners and professional nurses found the information provided on the mobile computing device to be very useful and easy to access. They indicated that having access to information at the point-of-care assisted them in many ways to make correct clinical decisions which impacted on the care that they provided to their patients (Ricks, 2012: 62).

1.2 PROBLEM STATEMENT

Healthcare providers in the world's poorest countries, who frequently have a lack of specialist care in different areas of medicine, are often unable to access medical and health information, thus preventing them from providing quality healthcare (Cardoso, Hutter, Hoppe, Winter, Celia, Duval, Lopes, Fernandes, Sparenberg, Adolfo & Russomano, 2007:211). In July 2012, the Eastern Cape Department of Health (ECDoH), in collaboration with various partners such as the Nelson Mandela Metropolitan University, Family Health International (FHI) 360, MTN and Qualcomm, embarked on a project to increase access to information via mobile computing devices for 62 medical practitioners employed at various public hospitals across the Eastern Cape Province in order to enhance their clinical decision making practices at the point-of-care.

Some of the problems that were intended to be addressed through the project were poor access to clinical and public health information among doctors, their inability to consult relevant medical texts at the point-of-care, and guidelines and tools which can improve the quality of diagnosis, treatment, and care of their patients. Family Health International (FHI) 360 provided the medical practitioners with a locally relevant, reliable, and accurate comprehensive library of medical information on mobile computing devices (MCDs) at the point-of-care. As part of the latter project, upon the request of FHI 360 and the Department of Health in the Eastern Cape Province, Ricks (2012:7) conducted a study to investigate the impact that accessing health information at the point-of-care via MCDs had on the clinical decision making practice of medical practitioners and professional nurses in public hospitals and primary healthcare settings in the Eastern Cape Province. The above-mentioned study was a quantitative study and therefore lacked an in-depth description of the experiences of medical and nursing practitioners with regard to accessing information at the point-of-care via mobile technology, for clinical decision making. The researcher, therefore, identified a gap in the abovementioned study and identified a need to conduct this study in order to explore and describe the experiences of the medical practitioners "in-depth" by conducting a qualitative study. The following research question was therefore posed:

How do medical practitioners experience accessing information at the point-of-care for clinical decision making via mobile technology at public hospitals?

1.3 PURPOSE

The overall purpose of the research was to explore and describe the experiences of medical practitioners with regard to accessing information via mobile technology at the point-of-care for clinical decision making. The collected data was utilised to make recommendations that could facilitate the use of mobile technology by other medical practitioners in implementing mobile technology to access health information at the point-of-care for clinical decision making.

1.4 RESEARCH OBJECTIVES

The objectives of this study were:

- To explore and describe the experiences of medical practitioners with regard to accessing information via mobile technology at the point-of-care for clinical decision making at public hospitals in the Eastern Cape Province.

- To make recommendations based on the research findings that could facilitate the use of mobile technology for accessing health information at the point-of-care for clinical decision making among other medical practitioners at public hospitals.

1.5 CONCEPT CLARIFICATION

The following concepts will be clarified:

1.5.1 Medical practitioner

A medical practitioner is a person who is registered as such under the Health Professional Act and includes an intern registered under that Act (The Health Professional Act, No. 56 of 1974). The medical practitioners in this study are the 62 medical professionals who were involved in the initial study, using mobile technology for accessing health information at the point-of-care.

1.5.2 Accessing information

Accessing information refers to the action by human beings in their purposive search for information as a consequence of a need to satisfy some goals (Abubakar & Harande, 2010:1). The information referred to in this study is information that the medical practitioner accessed via mobile technology in order to enhance clinical decision making at the point-of-care.

1.5.3 Point-of-care

Point-of-care refers to the place at which clinicians deliver healthcare services for the benefit of the patients, that is, the patient's bedside or in the doctor's office where health services are rendered (Chan & Stieda, 2010:51). In this study, point-of-care refers to the bedside of the patient at public hospitals in the Eastern Cape Province, where patients receive health related care.

1.5.4.Clinical decision making

Clinical decision making is the cognitive process of reaching a decision by weighing up the positive and the negatives of each option, considering all the alternatives, and choosing between different alternatives for that particular situation (Standing, 2010:19). In this study, the term clinical decision making will refer to choices that the medical practitioners made in regards to the management of patients who presented with various conditions.

1.5.5 Public hospitals

Public hospitals refer to a healthcare institution owned by a local government or state where sick or injured people are provided with medical or surgical care (Oxford Dictionary, 2012:292:481). In this research, the term public hospitals will refer to all state hospitals in the Eastern Cape Province where sick and injured people are being managed and cared for.

1.5.6 Mobile technology

Mobile technology refers to handheld devices that are easily moved from one place to another. Mobile technology is easy to start up, offers quick data entry, is capable of wireless connection to the internet, and is able to store and run applications (apps) on software such as clinical references and clinical support systems (Doran, Haynes,

Kushniruk, Strause, Grimshaw, Hall, Dubrowski, Di Pietro, Newman, Almost, Nguyen, Carryer & Jedras, 2010:6). In this study, mobile technology will refer to the device used by medical practitioners to access information for clinical decision making at the point-of-care.

1.6 RESEARCH PARADIGM

According to Bothma, Greef, Mulaudzi & Wright (2010:40), a paradigm is an accepted set of beliefs or values that guide research. Paton (2002:169) and Koole (2009:37) add that a paradigm is a lens that allows someone to critically evaluate a given phenomenon. Therefore, DiCenso, Bayley & Haynes' (2009:151) 6S Model was selected as the lens to critically view this phenomenon and guide this research. Using this model to guide decision making allows somebody to start searching on the highest possible layer in the 6S model. In an ideal situation, this would be the system layer for information.

Depending on the information sources needed by the medical practitioners, searching for information can be a labour-intensive and even non-productive process. Effective and productive searching requires the selection of the most appropriate information sources for the clinical question that the medical practitioners want answered. According to Worcester & Haynes (2012:33), there are four criteria to follow when choosing a source of information for clinical decision making: information should be evidence based, comprehensive, easy to use, and readily available. The researcher will therefore be using the 6S model of decision making as a lens through which to view the phenomena in the study, as the information resources that meet the aforementioned four criteria are best organised via the 6S hierarchical model of pre-appraised evidence. The 6S model comprises:

1. Studies consisting of original articles published in journals

2. Synopses of studies such as evidence based abstraction journals

3. Syntheses based on systematic reviews

4. Synopses of syntheses from evidence based abstraction journals

5. Summaries from evidence based practice guidelines and textbooks

6. Systems such as decision support systems

The 6S model of decision making has substantial benefits for medical practitioners and their patients; for example, evidence based abstract journals notify the medical practitioner of recent articles that meet the clinical related information needs of medical practitioners at the point-of-care. Hence, the 6S model of decision making provides an organised and effective approach to search for high-quality health related information (Worster & Haynes, 2012:34). The researcher hopes to identify additional benefits of how recent access to clinical related information via mobile computing devices at the point-of-care assists the medical practitioner in clinical decision making.

1.7 RESEARCH DESIGN

The research design refers to the overall plan or blueprint of how to obtain answers to the question being asked (Babbie & Mouton, 2006:41; Burns & Grove, 2011:253). A qualitative, exploratory, descriptive and contextual research design was used to conduct this study. A full description of the research design will be provided in Chapter Two of this study.

1.8 RESEARCH METHODOLOGY

The research methodology flows from the chosen research design and refers to the data collection process, which includes the sampling technique, the role of the researcher, the research methods used for data collection, data analysis, and ensuring rigour in the study (Botma, Greeff, Mulaudzi & Wright, 2010:199). The study in question was undertaken among medical practitioners, employed at public hospitals across the Eastern Cape Province, who were involved in the initial study as described in the introduction and problem statement.

1.8.1 Research population

A research population refers to the entire target population that is of interest to the researcher, and meets the criteria for inclusion in the focus study (Brink, van der Walt & van Rensburg, 2012:131; Botma *et al.*, 2010:100). Therefore, the research population for this study comprised the 62 medical practitioners employed at public hospitals in the Eastern Cape Province, who were part of the project and research

that was conducted in 2012, as previously mentioned. The medical practitioners who were not part of the initial study were excluded from the current study.

1.8.2 Sampling methods

According to Botma *et al.,* (2010:201), a sample is a subset of the population that is selected for a particular study in an effort to understand the population from which it is drawn. The researcher used a non-probability, purposive sampling method for this study. The sampling method involved the conscious selection of participants or elements that are typical or representative of the research under study (Burns & Grove, 2009:355).

Thus, a clear identification and formulation of pre-selected criteria for the selection of participants is essential (de Vos, Strydom, Fouche, & Delport, 2011:392). Therefore, the participants for this study were purposively selected by the researcher using an inclusive criterion, as will be discussed in greater detail in Chapter Two.

1.8.3 Data collection process

Data collection refers to the precise, systematic gathering of data from the participants relevant to the research purpose, and the specific objectives and questions of the study. Data were collected by means of semi-structured individual interviews. Burns & Groves (2009:693) point out that it is important to gain access to the research setting and to secure permission to collect data from the participants and the gatekeepers, and the individuals in authority (See Annexures A, B, C, D and G). Data were collected and recorded with an audio-tape recorder until saturation was reached. Data saturation occurs when no new information emerges during the data-collection process (Brink *et al.,* 2012:141). The data collection process is discussed in greater detail in Chapter Two.

1.8.4 Data analysis

In qualitative research, data analysis involves the examination of words and includes a process of inductive reasoning (Brink *et al.,* 2012:193). Therefore, a variety of data analysis strategies are used that involve interpreting the data by sorting, organising, and reducing the data to more manageable pieces and then exploring ways to reassemble the data, transcribing verbatim and analysing the data thematically (de Vos *et al.,* 2011:399). Tesch's proposed steps for analysing data were used to make

sense of the raw data in this study (Creswell, 2009:186-187). The above-mentioned steps of data analysis will be described in more detail in Chapter Two.

1.8.5 Pilot study

A pilot study serves as a small-scale version of a proposed study prior to the main study in order to test and refine the methodology and to assess the feasibility of the study (Burns & Grove, 2009:44; Botma *et al.*, 2010:275). The researcher conducted a pilot study in the same manner as described above with regard to the sampling, data collection and data analysis. The pilot study was conducted with two participants at public hospitals in the Eastern Cape Province in order to determine whether the research question was understood and unambiguous and whether the researcher would be able to collect the data to address the research objectives in order to analyse the data. The data obtained in the pilot study formed part of the main study.

1.9 LITERATURE CONTROL

The researcher conducted a literature control of the findings. This enabled the researcher to form a framework as a benchmark for comparing the findings of the study and contrasting the results, themes or categories of this research with other findings (Creswell, 2009:25).

1.10 TRUSTWORTHINESS OF THE STUDY

Trustworthiness is a means of ensuring data quality or rigour in qualitative research, based on the model created by Lincoln & Guba (1985). According to Polit & Beck (2008:539), the Lincoln & Guba's model proposes four criteria for developing trustworthiness: credibility, dependability, conformability, and transferability. Each of these aspects of trustworthiness will be discussed in further detail in Chapter Two.

1.11 ETHICAL CONSIDERATIONS

Babbie (2010:61) states that ethics is typically associated with morals, as well as rules of conduct and obligation, and it deals with matters of right and wrong. Ethical guidelines also serve as standards and a basis upon which each researcher ought to evaluate his or her own conduct and develop trust with the participants (de Vos *et al.,* 2011:114; Creswell, 2009:87). The ethical principles that were adhered to

throughout this study included the principal of self-determination, the principal of justice, anonymity, and confidentiality. The strategies that were used, to ensure that the latter ethical principles were adhered to, will be described in depth in Chapter Two.

12 DISSEMINATION OF RESULTS

The research findings will primarily be presented in the form of a dissertation, which will be presented to the Department of Nursing, and the Nelson Mandela Metropolitan University Library. The findings will also be communicated to audiences at conferences and seminars who will benefit from the findings. The researcher will also submit the dissertation to the appropriate healthcare authorities. In addition, an article will be published in a peer-reviewed journal.

13 CHAPTER LAYOUT

The research will include the following chapters:

Chapter One: Overview of the study

Chapter Two: Research design and methods

Chapter Three: Data analysis and discussion of findings

Chapter Four: Summary, conclusion, limitations and recommendations

14 CONCLUSION

The focus of this chapter was to provide a brief overview of the study that was conducted. The problem statement and research objectives were clearly stated and the research methodology and ethical principles were briefly described herein.

CHAPTER TWO

RESEARCH DESIGN AND METHODS

2.1 INTRODUCTION

The previous chapter provided an overview of the proposed research by highlighting the research problem, purpose and the objectives of the study. This chapter is intended to provide clear, thick description of the research design and methods that were used to conduct this study.

2.2 RESEARCH DESIGN AND METHODS

The research design focuses on the end product of the study and all the steps in the process to achieve the anticipated outcome (de Vos *et al.,* 2011:143). The research method involves the form of data collection, analysis, and interpretation that the researcher proposes for the specific study (Creswell, 2009:15). An overview of the research design and methods as applied during the study will be described below.

2.2.1 Research design

According to Botma *et al.,* (2010:108), a research design is traditionally referred to as the backbone of the study. It provides the structure for the research methods and design decisions that must be taken to plan the research. According to Babbie (2010:92), a given study can have more than one purpose, but the three most common and useful purposes are: explanation description, and exploration. The research design used in this study was qualitative, exploratory, descriptive and contextual in nature.

2.2.1.1 Qualitative research

Qualitative research is aimed at gaining a greater depth of understanding of human life experiences, as well as the meanings and perceptions that people attach to their everyday lives and at the site where the participants experience the issue or problem under study (Burns & Groves, 2011:73; de Vos *et al.,* 2011:31,65). Although the qualitative researcher has a few preconceived ideas and opinions about the phenomenon under study, the researcher stresses the importance of the participant's interpretation of events and circumstances rather than the researcher's own interpretation of the events and circumstances (Brink *et al.*, 2012:11). According to Botma *et al.,* (2010:182), qualitative research entails an in-depth examination of the qualities, characteristics or properties of a phenomenon in order to better understand or explain the phenomenon. Hence, in the research the researcher attempts to understand and describe the experiences of medical practitioners with regard to accessing information via mobile technology for clinical decision making, at public hospitals in the Eastern Cape Province.

A qualitative research is an interactive process between the researcher and the participant. The researcher was the main human instrument collecting data from the participants. As a result, the researcher had the opportunity to be actively involved in the data collection process. The data collected from multiple resources, such as observations and interviews, was reviewed by the researcher; this allowed the researcher to make sense of the collected data. For the purpose of analysing the data, the data was organised into themes and sub-themes. The researcher utilised the process of induction and worked back and forth between themes until a comprehensive set of themes was shaped or abstractions were established. Therefore, a qualitative design was appropriate for this study because the researcher intended to gain an in-depth understanding of how the medical practitioners experienced accessing information at the point-of-care via mobile technology for clinical decision making at public hospitals in the Eastern Cape Province.

2.2.1.2 Exploratory research

Exploratory research begins with a phenomenon of interest. According to Botma, *et al.*, (2010:50) to explore is relevant to qualitative study especially were little is known and the researcher develops an initial, rough understanding of the phenomenon. For instance, very little research has been conducted in South Africa regarding the research topic. Therefore, the researcher involved in exploratory research investigates the full nature of the phenomenon and the manner in which the phenomenon is manifested (Polit & Beck, 2012:18). Exploratory studies are conducted for the following reasons:

- To satisfy the researcher's curiosity and desire for better understanding

- To test the feasibility of understanding a more intensive study

- To develop methods and employ them in any subsequent study (Babbie, 2010:92).

In this study, an attempt was made to gain insight into the experiences of medical practitioners with regard to accessing information via mobile technology at the point-of-care for clinical decision making at public hospitals in the Eastern Cape Province. Semi-structured interviews were conducted with participants to obtain the necessary data that could be analysed to achieve the research objectives because very little information is available with regard to this phenomenon in South Africa.

2.2.1.3 Descriptive research

Descriptive research refers to the description of a phenomenon as it naturally occurs. Therefore, descriptive research provides an accurate representation of real-life situations. As such, the researcher will obtain more accurate information about characteristics within a particular field of study (Burns & Groves, 2009:237). Through descriptive studies, researchers are able to describe, observe and document aspects of a situation as it naturally occurs (Polit & Beck, 2012:226). For this reason, the researcher chose a descriptive study design to describe, observe and document the experiences of medical practitioners regarding the accessing of information via mobile technology for clinical decision making at the point-of-care at public hospitals in the Eastern Cape Province.

2.2.1.4 *Contextual study*

The context includes the environment and the condition in which the study takes place as well as the culture of the participants and how the participants interact in that specific location (Holloway & Wheeler, 2010:41,310; Burns & Groves, 2009:178).

The research was contextual in nature because the participants (medical practitioners) were interviewed within their natural setting (units in public hospitals where patients are being cared for). The hospitals were located in areas (in the Eastern Cape) that serve patients from different cultural and ethnic groups and socio-economic backgrounds, and the medical practitioners in the hospitals comprised of diverse racial groups - blacks, whites, and coloureds. Furthermore, the participants comprised of both males and females. Both urban and rural hospitals were included in the study.

2.2.2 Research methods

Creswell (2009:15) states that research methods involve data collection, analysis and interpretation in order to answer the question posed by the researcher for the study. Moreover, the purpose of the research methodology is to specify how the research was carried out and, therefore, to answer the research question (Brink *et al.,* 2012:199). The following research methods were utilized for conducting this research in order to explore and describe the experiences of medical practitioners with regard to accessing information via mobile technology at the point-of-care for clinical decision making in public hospitals in the Eastern Cape Province.

2.2.2.1 *Research population*

Babbie (2010:199) states that a research population is that aggregation of elements from which the sample is actually selected. Moreover, according to Brink *et al.,* (2012:56), the elements refer to all the individuals, objects, events or substances that meet the criteria for inclusion in a given universe. Therefore, Babbie (2010:343) states that a research population refers to those individuals who are the focus of the

research. For the purpose of this research, the population consisted of 62 medical practitioners employed at public hospitals throughout the Eastern Cape Province and who were involved in the initial study. The medical practitioners were provided with a locally relevant, reliable and accurate comprehensive library of medical information on mobile computing devices which were used from July 2012 for accessing health related information for clinical decision making at the point-of-care.

2.2.2.2 Sampling method

The researcher made use of a non-probability, purposive sampling technique to select the participants for the study. According to Burns & Grove (2009:343), purposive sampling can be referred to as judgemental or selective sampling whereby the researcher consciously selects certain participants, elements, events or incidents to be included in the study. Moreover, Botma *et al.*, (2010:126) state that the researcher has determined the most typical characteristics of the participants who should be included in the sample. Therefore, the research population in this study was purposively selected by the researcher using the following criteria for inclusion in the study:

Medical practitioners must:
- be employed at public hospitals in the Eastern Cape Province,
- have participated in the initial project,
- use the mobile technology loaded with a comprehensive library of medical information to access health information for clinical decision making at the point-of-care on a daily basis.

Participants who met the inclusion criteria were selected by the researcher to form part of the research. The researcher obtained a list of the 62 medical practitioners and their contact details from the researcher who conducted the initial study. The researcher then approached the medical superintendents at the public hospitals where this study was conducted to establish which of the 62 medical practitioners who participated in the initial study were still employed at these hospitals. Upon confirming who was still employed, the researcher started contacting the participants

to inform them about the study and enquire whether they would be willing to participate in the study. The researcher had great difficulty contacting the medical practitioners to enquire as to whether they would be willing to participate in this study because many of them had changed their telephone numbers and electronic mail addresses.

2.2.2.3 Data collection process

Data collection refers to the gathering of information required to address the research problem. According to Gerrish & Lacey (2010:136), data collection is dependent on approaches that are sensitive to the social context in which the data are produced. The researcher made use of semi-structured interviews which were either conducted face-to-face or telephonically as a means of data collecting from the participants in their natural setting. Kvale & Brinkmann (2009:130) state that, for a semi-structured interview, a type of interview a guide should be used that will include an outline of topics to be covered, with suggested questions.

The following questions were posed to each participant:

"*Tell me about your experiences in accessing information at the point-of-care using mobile technology?*"

"*Tell me about your experiences in using mobile technology for clinical decision making?*"

The process of entry into the selected hospitals was made possible by obtaining permission from the medical superintendents of the hospitals by informing them of the intended research (see Annexure B). This process could only begin once ethical clearance had been received from the Faculty Postgraduate Studies Committee (FPGSC) at the Nelson Mandela Metropolitan University (NMMU) (see Annexure A) and permission received from the Provincial Health Research Committee (see Annexure C). Once permission was obtained from all the relevant gatekeepers, interviews were scheduled at times convenient for the participants, in order to avoid interruption of patient care.

The available prospective participants were first contacted telephonically and then personally. The objective of the research was explained to all the participants and interview dates and times were scheduled. On more than one occasion, the interviews had to be re-scheduled due to the participants' busy schedules at the public hospitals. An information sheet was provided to each participant explaining the purpose and objectives of the study (see Appendix F). A number of the participants were unable to conduct face-to-face interviews due to distance or their busy schedules. Telephonic interview dates were therefore established for these participants and information sheets with the consent forms sent via e-mail to some the participants who had access to e-mail services. Data collection began when interview dates were established with the participants who agreed to participate in the study.

Two of the interviews were conducted in the natural setting of the participants, that is, public hospitals and units where the participants were caring for their patients. Therefore, the participants' experiences were not isolated from the context in which they worked. One of the interviews was conducted in a psychiatry hospital where it was very noisy and busy. The participant was on duty at the time and this was her only available time to conduct the interview. There were a number of interferences whilst conducting the interviews such as telephone calls and patients to attend to.

The second interview took place in an empty office in the hospital's operating theatres. The participant was on call and, as such, could not conduct a lengthy interview as she was awaiting a patient. The remaining seven interviews were conducted telephonically due to the remote location of the participants' employment, the participants' non-availability on a personal basis, and time constraints. However, the researcher was able to gather sufficient information that enabled her to develop a broad understanding of the participants' experiences of their work environment and how they experienced accessing information at the point-of-care for clinical decision making via mobile technology.

Prior to the interview date, the researcher confirmed the dates (telephonically) with the participants. The two participants who were interviewed face-to-face signed the Participant Consent Form and permission was requested and granted to use an audio tape-recorder to record the interviews (see Annexure E). Those participants

who were interviewed telephonically were sent the Participant Consent Form via email or fax. Although the researcher requested the signed consent forms to be returned to her, none were received from the participants. Nevertheless, telephonic consent was obtained from the participants to be included in the research and to record the interviews with an audio tape-recorder. The reason for recording the interviews was for the researcher to capture everything that was said by the participant throughout the interviewing process. Although prior efforts and arrangements had been made with the participants, it was not always possible to secure a place and time devoid of noise and distraction at the hospital.

The interviews conducted telephonically were not without their own distractions. The telephone lines were noisy and, on more than one occasion, the researcher had to change locations and venues to make the telephonic interviews possible. Furthermore, two of the participants were driving at the time, resulting in of the interruption of the conversation due to poor telephonic reception. One of the participants had to stop along the road at a nearby garage in order to resume the interrupted telephonic interview. Two of the participants were busy in their units and the one was waiting in maternity ward for a patient to deliver her baby.

The language used for the interviews was English as all the participants were fluent in the language, except one telephonic participant who had a foreign accent, resulting in difficulty in hearing the participant during the interview. Prior to conducting face-to-face and telephonically interviews, the researcher spent some time introducing herself to the participants in order to build rapport with the participants and to explain the purpose and the process of the research interview. The importance of confidentiality and voluntary participation were also stressed and the participants were reminded that they could withdraw from the study at any other point if they wished to do so.

As previously arranged with the participants, an audio tape-recorder was used to capture the interviews, thus ensuring that the participants' responses were transcribed verbatim and that no information was lost. The participants were asked if they had any questions or anything more to add. The recording equipment was checked to guard against equipment failure. The recording was checked immediately after the interview to establish whether the interview had to be re-done.

After completing each interview the audio-tapes recorder were labelled numerically, for example, interview one or interview two, and the date and time was recorded. Data saturation was reached after conducting nine semi-structured interviews. The service of an independent coder was used to assist the researcher with the coding process. Coding involves the process of organising the raw material into chunks or segments of text before bringing meaning to the collected information (Botma *et al.,* 2010:224). An accompanying letter was sent to the independent coder to instructor her to use the steps proposed by Tesch, as described by Creswell (2009:186-187), to conduct the data analysis and coding. The coding process will be discussed in greater depth in Chapter Three.

The participants were also informed that a follow-up interview might be needed if the data lacked some clarity. Participants were thanked for their time and willingness to participate in the research. Debriefing was not needed at the end of the sessions as participants were not distressed by the interviews or after the interviews. The interview process continued until data saturation was evident, that is, when information was repeated as the interview progressed.

The transcribed data was augmented with direct observational-notes (and those jotted down) taken during the interviews. Immediately following each interview, the researcher created a written account of what she had heard, seen, experienced and thought about during the course of each interview.

2.2.2.4 Field notes

Field notes are various notes taken by the researcher which is based on the non-verbal behaviour of the participant and is taken as soon as possible, at least at the end of the interview, for cross-referencing and accuracy (Chinn & Kramer, 2011:223; de Vos *et al.*, 2011:335). These notes will help the researcher to remember and explore the process of the interview. The researcher will also use this field notes for verification purposes in the research (de Vos *et al.,* 2011:359).

- *Direct observational notes*

The researcher utilised direct observational notes immediately after leaving the field, while the interview was still fresh in the researcher's mind. These notes presented a detailed description of what the researcher heard and saw during the interviews which included facial expressions as well as words mentioned by the participant during the interview. The setting of the two participants that had a face-to-face interview and the surroundings during all the two interviews was also captured by the researcher. All nine interviews were conducted during the day and over weekends. The work environment was constantly busy and noisy. Furthermore, during the two face-to-face interviews, people were continually walking past the interview venue. In addition, the interview time was limited to between 20 and 30 minutes due to the participants' busy schedules. The first two participants were nervous and even mentioned that this was their first research interview. The researcher had to reassure the participants and put them at ease. Once the participants repeated the same information, the interviews were stopped as the researcher was satisfied that data saturation had been reached.

- *Jotted notes*

Polit & Beck (2012:550) state that the researcher usually tries to unobtrusively jot down a phrase or sentence and mental recording that will later serve as a reminder of an event, conversation, or impression. The researcher jotted down short temporary words and phrases on a notepad which helped to develop more extensive field notes which could then be incorporated into the observational notes.

2.2.2.5 Role of the researcher

A qualitative researcher is the primary instrument of data collection and analysis and uses approaches that are sensitive to the social context in which the data are produced (Gerrish & Lacey, 2010:136). The researcher performed in the capacity of a human instrument in an effort to explore how medical practitioners experience accessing information via mobile technology at the point-of-care for clinical decision making at public hospitals. The researcher conducted all the interviews herself and was responsible for executing the research process in its entirety.

2.2.2.6. *Data analysis*

Data analysis is the most crucial phase in a research. According to Babbie (2010:394), qualitative data analysis is the non-numerical examination and interpretation of observations for the purpose of discovering underlying meanings and patterns of relationship. Hence, data analysis is not a distinct step in the qualitative research process, but is done concurrently with data collection (Brink *at el.,* 2012:193). Once data is collected, it needs to be assembled and organised in such a way that conclusions can be drawn from the data (Gerrish & Lacey, 2010:23).

During the research the information gathered during the interviewing sessions was transcribed verbatim by the researcher. The transcribed interviews were analysed and coded by both the independent coder and the researcher. Common themes and sub-themes which emerged from the respondents' answers were identified.

To assist the researcher in effectively executing the coding process, the proposed steps used by Tesch, as cited by Creswell (2009:186-187), were applied to analyse the data. The data were organised and prepared for analysis by transcribing the interviews, reviewing the field notes, and sorting the data. The steps that the researcher and the independent coder used to accomplished data analysis included the following:

- The researcher got a sense of the whole by reading all the transcriptions carefully and jotting down key words in the margin.
- The researcher selected one transcript at a time, read through the transcript to get clarity, not thinking about the substance of the information, but rather of the underlying meaning of the transcribed data.
- The researcher read through all the transcriptions repeatedly and individually. Similar topics were categorised and were formed into columns that were arranged as major topics, unique topics, and leftover topics.
- The researcher then used the list of topics, abbreviated the topics as codes, and wrote the codes next to the appropriate segments of the text. Thereafter, the researcher established whether any new categories and codes emerged.
- The researcher used the most descriptive wording for the topics and then turned the topics into categories. The topics that related to each other were grouped together.

- Each category was abbreviated and arranged in alphabetical order.
- The researcher accumulated all the data material belonging to each category in one place and performed a preliminary analysis.
- If the researcher deemed it necessary, existing data would be re-coded.

Application of the above-mentioned theoretical technique was used in analysing the data for the research. Upon completion of the coding, the independent coder and the researcher met and both reached consensus regarding the themes and sub-themes. Both the researcher and the independent coder agreed that data saturation had been reached and that there was no need for further interviews to be conducted. After this, the researcher discussed the themes and sub-themes with her research supervisors and the themes and sub-themes were finalised. The themes and sub-themes portrayed the content in a meaningful and descriptive way.

2.2.2.7 Pilot study

It is always advisable to conduct a pilot run before embarking on the actual research. If interviews are to be used, a wise researcher will conduct one or two pilot interviews to test the interview schedule, ensure technical equipment (such as an audiotape recorder) is working, and assess how long the interview is likely to take (Gerrish & Lacey, 2010:23). Additionally, during a pilot study, the researcher can recognise and address some of the problems that are identified, and adjustments to the instrument can be made or the feasibility of the study can be re-assessed (Brink *et al.*, 2012:57).

For the purpose of this research, a pilot study was conducted to establish whether the proposed research questions generated the necessary data to achieve the research objectives. The researcher conducted two semi-structured interviews for the pilot study in order to assess whether the sequence and wording of the interview questions were understandable to the interviewees and whether the research question generated the necessary data to achieve the research objectives. The participants were approached telephonically to ensure their willingness to participate in the research. These two interviews were presented to the research supervisors in order that they review the interviewing techniques and the two research questions

used by the researcher to identify the correctness of the method used, as well as to suggest amendments as necessary. The pilot study conformed to the necessary requirements and the data obtained were included as part of the main study.

2.2.2.8 Literature control

Literature refers to all the written sources relevant to the topic that the researcher has selected (Brink *et al.,* 2012:71). The purpose of a literature review is to convey to the reader what is currently published regarding the topic being researched (Burns & Grove, 2009:91). In addition, the researcher needs to indicate the relationship of the proposed study to the relevant literature, and to demonstrate understanding of the main debates in the literature (de Vos *et al.,* 2011:109).

For the purpose of this study, the researcher conducted a literature control in order to verify and confirm the research findings. The purpose of the literature control was ensured by comparing the themes and sub-themes with recent research. Literature control was concluded after the data had been analysed in order to avoid preconceived ideas about the problem under review, as indicated by the researcher.

2.3 TRUSTWORTHINESS OF THE STUDY

The criteria to evaluate the value of a study requires that the researcher make sure that the study is worthy of being taken into account. The researcher established trustworthiness by implementing the model of trustworthiness proposed by Lincoln & Guba (1985), as described in Brink *et al.,* (2012:172). Lincoln & Guba's model is based on the identification of four aspects of trustworthiness: credibility, dependability, conformability and transferability.

2.3.1 Credibility

Credibility makes reference to confidence in the truth of the data and the interpretation thereof. Therefore, the participants must be able to recognise the meaning that they themselves give to a situation and the truth of the findings in their

social context. The investigation must be done in such a way that the findings demonstrate credibility, in other words, that the reader will believe them (Brink *et al.,* 2012:172). To create confidence in the truth, the following strategies were implemented:

2.3.1.1 Triangulation

Triangulation is the process by which the phenomenon or topic under study is examined from different perspectives and methods. With the process of triangulation, it is possible to gain a multi-dimensional understanding of the phenomenon of interest (Botma *et al.,* 2010:87). Thus, the findings of one type of method can be cross-checked with another. Gerrish & Lacey (2010:335) state that cross-checking is intended to enhance confidence in the entire study. In this study, the use of triangulation was utilised by interviewing nine different participants to explore their points-of-view on the phenomenon of interest until data was saturated. In addition, the researcher ensured triangulation of data by conducting semi-structured interviews and making use of direct observation and jotted notes. As such, cross-checking was done so that confidence in the entire research study was enhanced. In addition, data were analysed with an independent coder who is experienced in qualitative research.

2.3.1.2 Peer reviews

Peer reviews can be done by seeking the ears of objective peers (and experts in qualitative studies) to review and explore various aspects of the inquiry. Peer reviewers have a general understanding of the study and are able to debate with the researcher during each step of the research process (Brink *et al.*, 2012:172). A consensus discussion was held with the researcher's two supervisors (who are experts and competent in qualitative research methods) about the research findings. The research expert will be able to detect bias in the research findings. The researcher also made use of an independent coder to verify themes and sub-themes in data analysis.

2.3.2 *Dependability*

Dependability refers to the provision of evidence, for instance, if the research were to be repeated with the same or similar participants in the same or similar context, the findings would be similar (Brink *et al.,* 2012:172). Thus, dependability refers to the stability of data over time and over conditions. In this research, all transcripts were read separately by the researcher, the independent coder and the two supervisors in order to scrutinise the data and to compare the conclusions being made. Consensus was thereafter reached on the final themes and sub-themes.

2.3.2.1 An independent coder

A coding process is the organising of material into chunks or segments of text before bringing meaning to the information (Botma *et al.,* 2010:224). The utilisation of an independent coder, who is experienced in qualitative research, was used to verify the themes and sub-themes. Thus, all the transcribed data was sent to the independent coder for coding. A letter indicating how to conduct the data analysis, according to the steps used by Tesch for transcription, was also attached. Consensus discussions between the researcher and the independent coder were reached on the themes and sub-themes derived from the interview findings.

2.3.3 Conformability

Conformability refers to the potential for congruency of data in terms of accuracy, relevance or meaning. Conformability guarantees that the findings, conclusions, and recommendations are supported by the data and that there is internal agreement between the investigator's interpretation and the actual evidence (Brink *et al.*, 2012:127,173).

To enhance conformability in this study, the researcher forwarded the audio-tape recordings and transcripts to her supervisors to verify the researcher's interpretation of the data with the actual evidence. An independent coder was also utilised to verify the identified categories and themes. A clean version of each transcription,

with guidelines on how to analyse the data according to Tesch, was given to the independent coder in order to verify researcher bias in the data (see Annexure H).

2.3.4 *Transferability*

According to Brink *et al.*, (2012:173), transferability refers to the ability to apply the findings in other contexts or to other participants. In this study, the researcher's sample of participants was medical practitioners accessing information via mobile technology for clinical decision making at public hospitals. The researcher provided a thick description of the data collected once saturation of data was established, in order to enhance transferability and to permit judgement of the research process. The research results were supported by direct quotations from the interviews with the participants. Thus, the findings of this research should be able to be transferred to other medical practitioners using mobile technology for accessing information via mobile technology at public hospitals or in similar situations.

2.4 ETHICAL CONSIDERATIONS

Polit & Beck (2012:727) state that ethics is a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal, and social obligations. The problems of ethics relate to obligations, right and wrong, conscience, justice, choice, intention, and responsibility (Burns & Grove, 2009:61). The researcher applied ethics in this research by following the ethical principles discussed below.

2.4.1 *Principal of self-determination*

According to de Vos *et al.,* (2011:119), the right to self-determination implies that individuals have the right and competence to evaluate information, weigh alternatives against one another, and make their own decisions. The principle of self-determination was adhered to throughout the research. Therefore, the participants in the study were informed that they could voluntarily decide whether or not to take part in the study without the risk of prejudicial treatment. The participants also have the right to ask questions or refuse to give information (Polit & Beck,

2012:727). During the data collection process, the participants were encouraged to ask questions, thus ensuring clarity of the research questions.

2.4.2 Informed consent

Informed consent is the prospective participant's agreement to participate in a study as a subject, and understanding the necessary information (Burns & Groves, 2009:201). The information given to the participants includes a full understanding of the benefits and possible risk associated with the research (Babbie, 2010:66). The researcher supplied the participants with an information letter which included the following information:

- request for permission to participate in research;

- the goal of the study;

- what is expected of the participant; and

- the benefits and rights of the participant.

The participant should have the opportunity to choose, voluntarily, whether or not to participate in the research. In addition, the participants were also informed of their right to terminate their participation at any point, without risk of incurring any penalties. The participants were also told, prior to giving consent that the researcher intended to publish the results of the study. In this study, the participants were given (and asked to sign) a consent form in which they gave voluntary consent to participate in the research (see Annexure E and F).

According to Brink *et al.,* (2012:44-45), consent from research ethics committees within health services is also necessary so that the researcher and the research participants are protected. Hence, written permission was obtained from the relevant authorities to conduct the research (see Annexure A, B and C).

2.4.3 Principle of justice

The principle of justice refers to the participants' right to fair selection and treatment (Brink *et al.,* 2012:36). The researcher ensured that the principle of justice was applied to the study by selecting the participants fairly, in accordance with the inclusion criteria of the research.

2.4.4 Right to privacy

Privacy refers to keeping to oneself that which is normally not intended for others or others to observe (de Vos *et al.,* 2011:119). The data collected from the participants during the course of the interviews was kept in strict confidence. The venue chosen for the face-to-face interviews was selected by the participants, for their convenience, in a nearby office where they were caring for their patients. However, the venue offered limited privacy due to the noise of hospital staff passing the venue. The right to privacy was maintained by the researcher by speaking soft enough, yet in an audible voice, for only the participant to hear. Privacy was also ensured through anonymity.

2.4.5 Anonymity

Gerrish & Lacey (2010:31) state that a common way to ensure confidentiality is to anonymise both individuals and organisations. Therefore, the participants' identity cannot be linked to any of the data obtained, even by the researcher. Anonymity was also ensured by assigning numbers to the participants during the interviews and assigning a corresponding number to the audio-tape recordings, for example, participant one was linked to audio-tape recording one. No institutions' names were mentioned in the transcriptions. Audio-tape recordings, transcribed interviews, and field notes will be kept in a secured place for five years after the research, for auditing purpose. Only the researcher, supervisors, and independent coder had access to the information obtained during the data collection process. Prior to their consent, the participants were informed that the research findings would be made known in the research report. Polit & Beck (2012:162) state that when anonymity is impossible, confidentiality procedures need to be implemented.

2.4.6 *Confidentiality*

Confidentiality can be viewed as a continuation of privacy, which refers to an agreement between persons that limit others' access to private information (de Vos *et al.,* 2011:119). The researcher maintained confidentiality throughout the study by applying the principals of privacy (as previously mentioned). In addition, only the researcher, two supervisors, and independent coder had access to the information obtained during the interviews. The participants were informed that quotes from the interviews would be used in the written report.

2.4.7 Principle of beneficence

Beneficence imposes a duty on the researcher to minimize harm and maximize benefits (Polit & Beck, 2012:152). Participants can be harmed in a physical and/or emotional manner. It is an ethical obligation that rests with the researcher to protect the participants against any form of physical discomfort that may emerge from the research project (de Vos *et al.,* 2011:115). In this research , there was no discomfort or harm caused to the participants.

2.5 CONCLUSION

This chapter provided a description of the research design and methods employed in the study, in relation to the experiences of medical practitioners regarding the accessing of information via mobile technology, at the point-of-care, for clinical decision making at public hospitals.

The research population, sampling, data collection process, data analysis and pilot study were all described in this chapter. The measures for ensuring trustworthiness were described herein, and the ethical considerations that need to be adhered to were also discussed in this chapter. In the next chapter, the researcher will discuss the data analysis and conduct a literature control in order to verify and confirm the research findings.

CHAPTER 3

DATA ANALYSIS AND DISCUSSION

3.1 INTRODUCTION

An in-depth description of the research design and methods was provided in the previous chapter. The focus of this chapter is an in-depth discussion of the research findings derived from the analysis of the semi-structured interviews conducted with the research participants. The aforementioned findings will be substantiated and verified with reference to existing literature in order to confirm, contradict or present a new dimension to the phenomenon being studied.

3.2 PRESENTATION OF RESULTS

The participants who were interviewed in the research study comprised of nine medical practitioners working in public hospitals in the Eastern Cape Province, who were using mobile technology for accessing information at the point-of-care for clinical decision making. Data were collected from all participants who were purposively selected and who agreed to participate in the research study. Semi-structured interviews were conducted with all nine participants. The interviews were all conducted during the week, with the exception of two interviews that were conducted over the weekend. The participants requested that the interviews be conducted at times that were convenient for them because they had tight schedules. Seven of the participants preferred to be interviewed in the afternoon because they would not be pressed for time then, and had some time available to be interviewed. Only two participants requested to be interviewed in the morning. Two of the interviews were conducted face-to-face and the remaining seven interviews were done telephonically, due to distance barriers and time factors. All interviews were recorded using an audio tape recorder. The interviews conducted by the researcher were transcribed verbatim. The transcribed interviews were sent to an independent coder for assistance with the data analysis and coding. The interviews were

accompanied by a written letter instructing the independent coder to apply Tesch's method for data analysis and coding (see Annexure H).

The research results revealed that the age distribution of the participants ranged between 28 and 50 years. Five of the medical practitioners who participated in this study were males while four were females. All the participants were on duty at the time of the interview, except two who was traveling by car. All the participants had between four and five years' experience in the medical practice. Participants were asked to respond to the same two questions, with further probing where the researcher deemed necessary. The basic questions asked were:

"*Tell me about your experiences in accessing information at the point-of-care using mobile technology?*"

"*Tell me about your experiences in using mobile technology for clinical decision-making?*"

Creswell (2009:183) describes the process of data analysis as preparing the data for analysis, conducting different analyses, moving deeper and deeper into understanding the data, representing the data, and interpreting a large amount of data. In this study, the researcher has made decisions about how to interpret the data by sorting, organising and reducing data to exploring ways.

In the following paragraphs, the analysed data will be presented; it will first be presented in a summarized tabular format, which will be followed by a narrative description. The narrative description is guided by the themes and sub-themes that have emerged from the interviews.

3.3 IDENTIFIED THEMES

The concept "themes" refers to the major findings of the study; these are used to create headings in the report on the findings. Themes should display multiple perspectives from individuals, which are supported by diverse quotations and specific evidence (Botma *et al.,* 2010:225). Two main themes and six sub-themes emerged in relation to the experiences of medical practitioners, regarding the accessing of information at the point-of-care for clinical decision making via mobile

technology. Table 3.1, below, represents the identified Main Themes and Sub-themes of this study.

Table 3.1: Main themes and sub-themes related to the experiences of medical practitioners regarding the accessing of information at the point-of-care via mobile technology for clinical decision making at public hospitals.

THEME	SUB-THEME
Theme 1: **Medical practitioners shared the benefits of using mobile technology for accessing information at the point-of-care in clinical decision making.**	Medical practitioners experienced: 1.1 Improved access to information such as electronic health records, medical references, and medical applications necessary for clinical decision making 1.2 Improved patient care and management 1.3 That the easy mobility of the device improved accuracy, efficiency and productivity with regard to clinical decision making
Theme 2: **Challenges experienced by medical practitioners related to the use of mobile technology for accessing information at the point-of-care.**	Medical practitioners experienced: 2.1 Technical issues related to the use of mobile technology 2.2 The guidelines available on tablets are outdated 2.3 A lack of financial reimbursement for airtime used for tablets, especially when used to support clinical practice

3.4 DISCUSSION OF THE MAIN THEMES AND SUB-THEMES

A thick description of the themes and sub-themes will be provided in the following paragraphs. The identified themes and sub-themes will be discussed with the incorporation of direct quotations from the raw data to support the description of the findings, in addition to the use of the relevant literature to confirm, contradict or present a new dimension of the phenomenon.

3.4.1 Theme 1: Medical practitioners shared the benefits of using mobile technology for accessing information at the point-of-care in clinical decision making.

The participants indicated that they experienced numerous benefits with regard to accessing information for clinical decision-making at the point-of-care, via mobile technology. The benefits experienced by most of the participants included providing better care for their patients by being able to access information much quickly via the mobile technology. *"I think it's just that mobile technology I think is very beneficial for medical practitioners. It really helps us in better care for the patient and getting access to information much quicker..." (P1:4).* For most of the participants, the experience was a good one because the information was at the tips of their fingers and it assisted them with clinical decision making at the point-of-care. *"So basically with the device you've got access to all this information at your fingertips" (P4:2,3).*

The sub-themes that emerged for Theme 1 included:

- Medical practitioners experienced improved access to information such as electronic health records, medical references, and medical applications necessary for clinical decision making.
- Medical practitioners experienced improved patient care and management.
- Medical practitioners experienced that the easy mobility of the device improved accuracy, efficiency and productivity with regard to clinical decision making.

3.4.1.1 Sub-theme 1.1 Medical practitioners experienced improved access to information such as electronic health records, medical references, and medical applications necessary for clinical decision making

The participants indicated that they experienced improved access to information such as electronic health records, medical references and medical applications necessary for clinical decision making. The participants indicated that the hospital has Wi-Fi which facilitates an internet connection, thus allowing easy access to all the electronic health records and information. According to Beal (2010:1), Wi-Fi is a wireless networking technology that uses radio waves to provide high-speed network and internet connectivity. The electronic health records of patients, which the participants indicated could be easily accessed, included patients' x-rays and blood results. The participants expressed that they could access patients' x-rays via wireless on their mobile computing device and did not have to stand in a queue at the web station made available in the ward for viewing patients' x-rays. The participants experienced being able to access patients' x-rays via the mobile technology to be very convenient because it enabled them to view patients' x-ray images as soon as they were available. The participants also indicated that they could view the patients' x-rays anywhere and at any time on their mobile computing device and, therefore, it eliminated having to walk to the x-ray department to get the x-ray results. This is illustrated in the evidence from the raw data, below:

"...we getting sort of well into the habit of looking up x-rays which are available wirelessly. The hospitals was network declared Wi-Fi and in clinical spaces. So we can now access the digital x-rays on air and on an IPAD or on a web station in the ward and which is at that because we literally have to walk to where they gave us everything that we want and looking for. That makes it useful and extremely magnificent. So ja, so I mean, given access has been really fantastic and as we tried those" (P9:1,3).

"So I think basically the few things that I do so ... I mean well ... our hospital is wired [have wireless] to give x-rays on IPads and IPhone you should know which. So that the first way that I access, have [mobile] technology because that makes it makes ... the x-ray available wherever I am in the hospital and it means that I don't have to find an x-ray or find a (unclear). I just can go to my [mobile] phone or look on an IPad

and that obviously extremely convenient and it makes life a lot easier and also saves time because I don't have to find an x-ray or find a place to look for an x-ray" (P8:1).

"…you don't have to wait for every doctor to finish on the computer, which you also have to take into consideration you look at chest x-rays, you look at CT's…" (P1:2).

According to Li, Westbrook, Callen & Georgiou (2012:5) accelerated access to radiology images and results become immediately available upon completion of the investigation, by negating the need to collect physical films from the radiology department or expecting its transport by ward staff. Therefore, mobile technology has the ability to make the viewing of radiographic images in the orthopaedic and medical community possible (Tennant, Shankar & Dirschl, 2013:228).

The participants indicated that in 2014 a system called TrakCare was introduced which gave medical practitioners access to all types of specimen results online; this made a significant difference in their lives. TrakCare Laboratory Information System (LIS) is a unified healthcare information system that enables coordinated care within a hospital or across care settings throughout a region, thus facilitating a seamless patient journey. TrakCare Lab LIS ensures that all patient data are kept in a single database that can be accessed from any laboratory. Patient searches are quick and easy.   These results are also available via the WebViewer (Pillay, 2010:1). Obtaining specimen results were time consuming in the past. All specimens are now barcoded; this makes accessing results online much easier, especially when needed at the patient's bedside. The benefits of the availability of TrakCare, via the use of mobile technology, were illustrated in the following quote:

"Then over a course, kind of the sort of year April month to October 2014 the lab moved over to a system which they called TrakCare and where their result are basically available to online and viewer and that's ... that's has made a huge difference, because all the results that are barcode and all specimens are now barcoded ... and so area, different area of our life. Put in the barcoding and get the actual blood test that you are looking for because through the apps ... because ... so universal patient identified and it can be something very difficult tracking down results. This has made it so much easier and available and even popular more at

the bedside … So being able to get online quickly on to the PATHCARE website and look up the barcoded blood result or sputum results makes a massive difference to that, so that blood results gets reviewed and finally you get to the next patient" (P9:2-3).

All the participants indicated that they can access blood results from their mobile devices using labtrak, which is a national TrakCare Website. Labtrak allows communication between testing laboratories and medical practitioners at the point-of-care; it allows medical practitioners to access laboratory data from anywhere in the hospitals. The laboratory results were also available from different sites, for example, NHLS (National Health Laboratory Service) and TrakCare. The NHLS is a public network of laboratories that conduct diagnostic pathology services in South Africa (Ancer, 2015:1). The participants expressed that this was such an easy process because all they had to do was to type in the patient's folder number or barcode together with their own password when searching for a patient's blood results. The participants indicated that by being able to access the blood results via mobile technology, facilitated speedy clinical decision making and appropriate management of the patients. Constraints, such as wasting time by physically going to the laboratory, waiting on the phone, trying to phone the laboratory for emergency blood results, were eradicated. The quick access to laboratory results is time saving, hence, making it possible to attend to the next patient quicker. This is evident in the quotes below:

"… on the internet like I said getting the blood results and stuff of the patients that are on labtrak. They are the national TrakCare Webb you can. You can type in the patient's folder number … you can find the patient's blood results so that was one thing that you use. That's the … [National Health Laboratory Service] NHLS is who does bloods the lab [laboratory] that does our bloods and all the results are on their system, so you access it via the internet … Mm ... And so it is nationally so you type in your password and your code and then you can type in your patient's folder number. So just say you have a patient so that now you to waiting to see if you done blood on them earlier … So you ... you use internet try to find get on their website NHLS ... mm ... site to get their bloods and stuff" (P2:3).

"So with the mobile technology gives you quicker access to results which is quicker treatment for your patient for the specific condition. So that you don't have to run to a lab [laboratory], waiting in a queue maybe for result or maybe having trouble with the system not printing the results. Where with your mobile technology you can have the results access to you visually and you don't need to wait for any form of other technology externally to print the results for you" (P1:2).

"The one thing is that I can access lab [laboratory] results through the internet labtrak system and that is also obviously very useful wherever I am, I can check results for my patients on that system. Uhm ... blood results, sputum results, histology results. Pretty much all the results on the lab system I'm able to get hold of…" (P8:2,7).

According to Calabretto *et al.,* (2014:1-2), mobile technology provides opportunities for viewing test results at a time convenient for medical practitioners. This has been confirmed by Li *et al.,* (2012:2), who stated that diagnostic test results were also available electronically on mobile technology, thus enabling medical practitioners to readily access and find patients' available laboratory results online, to enhance clinical decision making (Putzer & Park, 2012:7).

The participants also experienced that the use of mobile technology for accessing medical information at the point-of-care for clinical decision making was very user friendly, since they were able to find the necessary information as quickly as possible. The participants also indicated that the information available on the mobile computing device was easy to use as a quick reference at the point-of-care and it supported them with more complex clinical decision making:

"So it was easier for us to get info ... information using our mobile phone…yes. It was easier it was quicker… Yes it was easier, quick reference so ja I found that it was user friendly" (P5:1,3).

"Ja ... you know, I mean, I think that, for clinical decision-making it's harder because that takes time and so it's good the ... the mobile thing are useful. It's useful as a reference. It's useful ... if I know what I'm looking for and I try look it up quickly, its useful. For the kind of more complex clinical decision making… "(P8:9).

"Yes because it was something to just remind me and though I even read through it but it something most of the thing I know …" (P7:4).

The participants further indicated that improved access to information via mobile technology supported them with medical references on new diseases that are not so common. Some of the diseases that they encountered are new to them and they are not sure how these should be managed. Having the information readily available, on their mobile computing device, assisted the participants to read up on these new diseases and it supported them in clinical decision making regarding patient management at the point-of-care:

"… stuff that you were confused about, you'll be able to look it up [information] … So anything that you confused about so obviously that ... that would help you because now you got access to what you need to be able to make a decision regarding ... regarding patient management" (P2:5).

"… when you stuck or … disease that are not so common you need little refresher." (P4:2).

"It also helps you maybe if you not...found new illness that you haven't treated commonly …" (P1:4-5).

An increased number of medical practitioners use mobile technology for regular references, such as electronic medical and drug textbooks, to support and verify diagnostic and therapeutic decisions in their practice (Li *et al.,* 2012:8). Hardyman, Bullock, Brown, Ingram & Mark (2013:9) concur that medical references are used at the point-of-care to support medical practitioner clinical decision making and to improve patient care. In addition, the research findings according to Harrington (2014:91), stated that information via mobile technology have better patient care coordination, reduce patient safety risks and minimize hazards at the point-of-care.

The participants indicated that mobile technology also assisted them in obtaining medical references via emails from other health professionals, thus supporting them with decision making and patient treatment. In addition, the improved access to information via reliable websites assists the participants with the correct management of patients. This eliminated patients having to return for further management because they were competently managed during their initial visit.

"… that you can also get assistance from other professionals via emails or via reliable websites to ask for questions about what care they gave the patient maybe assisting, you not ... giving you direct treatment but assisting you in making decision for correct management of that patient, and also to look for quick care medication dosage" (P1:4-5).

"For the patient yes ... for the patient as well because you don't have to maybe ask, call the patient again. Because sometimes you need to call asked for advice and then bring the patient again" (P5:5).

According to Ndosi & Newel (2010), as cited in Ricks & Ten Ham (2015:2), medical practitioners like nurses prefer to consult human sources such as colleagues because their information needs are triggered by patient needs which require quick decision making at the point-of-care. These human resources have a higher level of experience, clinical relevance or perceived specific expertise (Newman & Doran, 2012:62). In addition, healthcare providers such as hospital and clinic staff have extensive knowledge in their field to support clinical decision making at the point-of-care (Modeste & Majeke, 2014:5).

The participants indicated that mobile technology has become particularly useful to access relevant information without having to cause injury to them by carrying around heavy reference books. Clinical decision making becomes easier because the participants indicated that they glance through the information on the mobile device.

"Well I found it [mobile technology] extremely useful mainly from the point of view that you no longer have to break your back carrying heavy reference books in order to access the information" (P6:1).

"…you don't have to carry a big text book and it is easier you know you just browse through, yes. So you make a decision faster" (P5:5).

"… but instead of carrying a whole bag of books…" (P8:10).

The participants indicated that books were pre-loaded onto the memory card of their mobile devices as well as several other important sources of information that

facilitated speedy clinical decision making at the point-of-care. Easy access to information on the mobile devices was made possible, thus allowing the participants to have several additional resources with them at the point-of-care. The following quotes illustrate this:

"So the tablets [mobile device] were loaded with a number of basically electronic versions of paper handbooks and the Children-Child Health handbook for the Eastern Cape… so that the [portable document format] PDF of the paper version and put it online" (P9:4).

"… they already gave it to us with a few of the books uploaded on it. There is a white book that we have as an Eastern Cape guidelines for Paediatrics care, so that was already downloaded on it. So ... I felt that that was quite helpful because all those books was there in the tablet without you have to carry it, you know, five, six, book around and it is easy to access those books. Whereas before you have to carry three, four books around to, you know, you know look it up, now these book are fed on there, so it is easy to access that" (P2:1-2,5).

"There are books there. If like for instance there are (Book name unclear). There was a Medi Interim medicine book. The one that were written by Professor … that were loaded there [mobile device]. So if you like for instance just in a rush... I want to just remind myself of something and I want to check something so I could quickly go there and look on to that bookshelf and I look there for information" (P7:3).

"I'm actually, my basic thing is, what's so nice about that it makes you able to have many more resources available because it's obvious a small thing but … you can have … one small thing [mobile device] available and…" (P8:10).

One of the participants indicated that the electronic handbook that was loaded on their mobile devices was specifically put together for the Eastern Cape hospitals and was extremely useful in clinical decision making at the point-of-care.

"Written specific for the Eastern Cape and then the others ... as I said the hospital virtually, the hospital handbook which is, we kind of put together both through (Doctors name unclear) at our hospital. So ... so they ... ja the two handbooks is the

Eastern Cape handbooks [which are extremely useful in clinical decision making], the Eastern Cape Medicine. It a handbook done ... made by Doctor (name omitted)" (P8:5).

According to Calabretto *et al.*, (2014:1), the merging of information and communication technology on "smartphones" has made mobile technology popular among medical practitioners, for accessing information at the point of care. Mobile technology allows medical practitioner's access to a variety of online articles, electronic handbooks, clinical medicine handbooks, drug reference and anatomy atlases (Archibald, Macdonald, Plante, Hogue & Fiallos, 2014:2). Several online medical references made improved access to information possible, thus providing medical practitioners with quick and appropriate suggestions for various clinical symptoms so that better clinical decisions making is made possible (Liao, Hsu, Chu. William & Chu. Woei-Chyn, 2013:139). This statement is echoed by Johansson Petersson, Saverman, & Nilsson (2014:221) who stated that a mobile computing device prepared with information that is relevant to patient care increases the effectiveness and efficiency of patient care.

Some of the participants indicated that they also make use of the internet in addition to the pre-loaded information because they experienced the use of the internet to make it easier for them to, at times, quickly access and read new information.

"And then ... and then obviously the third way that I access information on my mobile is to ... is by accessing the internet and ..." (P8:2).

"...I think whenever there is new information it is easier accessible on your device and when you need to refer to something from the new information you quickly read..." (P4:2-3).

According to Putzer & Park (2012:7), mobile technology connected via the internet facilitates the connection for medical practitioners to access information. The required information was accessible and obtained via the internet (Johannson *et al.,* 2014:228). Moreover, Archibald *et al.*, (2014:6) stated that mobile technology also has the capacity to store a large amount of information and to connect to online information resources. This includes the use of mobile technology for online

reference evidence sources (Li *et al.*, 2012:1-2), thus allowing medical practitioners improved clinical decision making at the point-of-care (Mickan, Atherton, Roberts, Heneghan & Tilson, 2014:7-8).

All the participants found the pre-loaded guidelines to be very useful because they needed this information on a regular basis. The participants indicated that the guidelines assist them in adequately caring for their patients. Some of the guidelines that were pre-loaded included the Guidelines for the management of Tuberculosis (TB) and the Human Immune Virus (HIV), as well as in paediatric cases and the Essential Drug List (EDL). The following quotes are evidence of this:

"But with the mobile technology they ... it is easier they load all the guidelines… that you are using ... consultants that work here. So when you need to find the guidelines they are at your fingertips" (P4:1).

"… copies off the HIV Guidelines and copies of the EDL and things like that. So ja, basically it did come with that [guidelines]" (P9:4).

"It is a ... the one that I could remember that was very useful because I was dealing with paediatricians ... paedia ... paediatric patients. So we had guidelines for paediatric patients … yes it was new guidelines" (P5:2).

"There is a white book that we have as an Eastern Cape guidelines for Paediatrics care, so that was already downloaded on it. So ... I felt that that was quite helpful …" (P2:1-2).

According to Gautham, Lyengar & Johnson (2014:1), the clinical guidelines, which are now accessed on mobile technology, contain essential health information on how to diagnose and manage common diseases and improve the health outcome. This is concurred by Mickan *et al.,* (2014:6-7), who state that guidelines improve the consistency of care by interactive diagnostic interventions loaded onto the mobile device. According to Li *et al.,* (2012:6), Information and Communication Technology (ICT) improved the ability of medical practitioners to integrate decision making links to therapeutic guidelines and alerts to drug interaction in order to reduce error and support advanced practice. The World Health Organization's (WHO) Integrated

Management of Childhood Illnesses (IMCI) is one example of specific guidelines for children's diseases (Gautham *et al.,* 2014:2).

Participants felt the applications (apps) on the mobile devices to be very useful when information is required at the point-of-care and that eliminated running around for information when needed. Some of the participants verbalised that they were given mobile devices that were already loaded with different apps, for example, the Medscape app. According to Parikh (2012:1), Medscape is one of the leading medical resources used by medical practitioners, medical students, nurses, and other healthcare professionals for clinical information and is the most downloaded free application in the medical category. The application offers evidence-based disease references, updated medical news and educational resources. The participants indicated that the applications are available on the website; however, these websites are far more updated than the current information that was available and preloaded onto the mobile computing device. Hence, the participants indicated that if they are uncertain about a medication, for example, the side effects of Penicillin, they can search these apps for the latest updated information. The participants also indicated that these apps provide quick-access to reliable and comprehensive drug information, such as drug dosing, drug interactions, warning, precautions and the safe use of medication. This is illustrated in the quotes below:

"… and also to look for quick care medication dosages. You can quickly look on the internet instead of running around looking for book to read up what the medication dosages are. What is the latest best medication for certain illness? All these access much quicker on mobile technology …" (P4:4).

"Websites like where you needed to look up Medscape for dosages of drugs. Maybe stuff like Medscape so if you have a ... a query regarding a drug dose or a drug you not sure about … whether you can use on this patient or the side effects or what to do or patient is allergic to one, for example, penicillin or the other he is supposed to be on..." (P2:2-3).

"... I can't actually tend to go to websites as much as, use an app on my phone which is the MEDSCAPE app which is ... it is an app that sort of searchable and useful from a ... it kind of find information required awhile" (P8:5).

Furthermore, one participant indicated that the more updated and reliable the information on the apps is, the better the clinical decision making of the medical practitioners will be:

"That's a better, the more reliable and updated information you have, when you making decision by the patient the better your decision is gonna be, hopefully. I think that things like Medscape and other electronic resources also help quite a lot, it increasing in people using at least some kind of electronic stuff. So I think ja that makes a big difference and like I'm saying, you see something very unusual and something you not familiar with, being able to turn to something like Medscape … and use it" (P9:6-7).

Some of the participants indicated that they are able to access the latest research and evidence based medicine information from an app called E-medicine. E-medicine is a free mobile app available to the individual who registers online; this app includes news and drug information (Archibald, 2014:3). The participants felt that the apps have evidence based medicine from the latest research done.

"There ... there is E-medicine ... E-medicine.com. It ... it's a Medline supported website with guidelines… But the one that I found most user-friendly was the E-medicine and of course there is a ... what is this website ... it is the Up-to-date website ... also very helpful… and it also up to date nothing ... it calls from the latest research. So it is more like evidence based medicine website" (P4:2).

According to Ventola (2014:357), apps are software programs that have been developed to run on a mobile computing device to accomplish a specific purpose. Medical practitioners in public hospitals use downloadable apps as personal and professional tools which include apps for drug guides (Calabretto *et al.,* 2014:2). These apps have a positive impact on error prevention, for example, drug-related information, since it provides increased access to updated information and therefore assists in clinical decision making (Calabretto *et al.,* 2014:2).

Some of the participants indicated that they used the mobile computing device to access the Snellen's eye testing apps. According to Marsden, Stevens, & Ebri (2014:16) the Snellen's vision chart actually tests the patient's visual acuity, which is designed to improve eye care and is valuable for diagnosing the patient's visual acuity at the point-of-care. The chart can help to determine how well the patient can see letters and shapes. The participants indicated that the test results are immediately available, hence, the app assists in clinical decision making at the point-of-care. This is evident in the extracts from the interview responses below:

"Then the second app that I used its one for eye, called the and ... e ... e ... Snellen chart that I can test the visual acuity based on that. So ja the ... the ... the phone has become more and more useful I mean and mobile technology has become more useful for me to actually to do the work that I do. Ja, so I think that ... ja I mean basically it. An app is not that useful if it takes too much time because you have ... you have a limited amount of time with your patient and you don't want to spend a long period of time looking through things. So the apps that worked well are the ones that getting you information quickly and so the two apps that I used that I like are the Snellen's chart and the ... and ... ja the Snellen chart, the ..." (P8:2, 8)

One participant indicated that there are a few other applications that he found very useful: the one app assisted the participant with medical calculations related to drug dosages and drops per minute for intravenous infusions; another app helped with working out the Glomerular filtration rate (GFR); and, a different app calculated the estimated date of delivery for pregnant women. The participant indicated that the Glomerular filtration rate calculator is a simple app that provides medical professionals with an elegant, highly efficient, and easy way to estimate the Glomerular filtration rate (Botev, Mallie, Wetzels, Couchoud & Schuck, 2011:937).

"Ok good, the ... the other app that I use. The one app it's the one that help me with just merely medical calculations. It helps me to work out the date of the mother about to give birth and a few other things. So it's just a simple calculating tool that helps me with some calculations that I need to do in my medical practice; the one that helps me to work out [Glomerular filtration rate] *GFR"* (P8:2).

"The programme for calculating dose, calculating drip rate, saving time" (P6:3).

According to Thomas (2011:1085), the Joslin Vision Network program provides digital screening for diabetic retinopathy. At the same time, retinal images are interpreted at referral centres and treatment is recommended in resource-poor settings, often with limited access to ophthalmologic services. In addition, the emergence of mobile technology in the clinical environment was promoted and embraced by the physician market as a result of the development of mobile software which addressed medical practitioners' information needs, such as the need for medical calculation and medicine dosages (Brown & McCrorie, 2015:93). These apps are used by medical practitioners for the purpose of medical calculations, clinical communication and diagnosing (Mickan *et al.*, 2014:2). Therefore, mobile technology is an important technological device used to assist medical practitioners with clinical tasks (calculations) and clinical decision making (Putzer & Park, 2012:1).

3.4.1.2 Subtheme 1.2: Medical practitioners experienced improved patient care and management

The participants indicated that they experienced being able to provide improved patient care since they were better able to manage the patient because they were able to access information for clinical decision making at the point-of-care, via mobile technology. As a result, patients received better quality of care from medical practitioners because of this:

"Well I've, over the past few years in working in a clinical set up, it's made your patient care much more improved and you can give your patient much better quality of care with your mobile technology access. So ok it improves your way that you can manage your patient" (P1:1,4).

"Ja I think as a result of that it also improve the quality of care ... yes" (P8:8).

"…does access to mobile helped technology and improved the quality care with my patients and qualify it yes ... it did improve the quality of care ... then again I think because of the first step on the road that improves the quality of care and I think where we are now saying access to mobile [information], does improve quality of care" (P9:7).

"To come back to your question about the mobile technology and how with the improvement that it can ... that it can it give. It's very important in any set-up to think about the best care for your patients" (P1:2).

Participants also indicated that improved patient care and management was possible because they were able to make clinical decisions much quicker because of the access to information at the point-of-care, via the mobile technology. The following quotes illustrate this:

"So to look at technology for clinical decision-making is also very helpful because a person can quickly go on to your mobile phone, going into a very resourceful medical website and get information which can assist you to help the patient with the best care for that patient" (P1:3).

"So, in terms of managing the patients. It is easier, it quick, it is easier you get information. So in decision making it was very easy and very useful" (P5:1).

"I think it's just that mobile technology I think is very beneficial for medical practitioners. It really helps us in better care for the patient and getting access to information much quicker and thinks it's ... it improves our quality of care for our patients" (P1:4).

For medical practitioners, caring is a popular concept in treating patients and forms part of good patient care value (Chokwe & Wright, 2013:1). It is evident that information via mobile technology has been used by medical practitioners to improve access to care and monitoring the health conditions of patients (Norris, Swartz & Tomlinson, 2013:370). This is echoed by Watkins, Kennedy, Lee & O'Neill (2012:256) who stated that improved patient-centred care is being pursued, in a variety of ways, through advancements in mobile technology. In addition, the information accessed via mobile technology has improved the effectiveness, efficiency, patient safety and high quality of care received by patients (Johansson & Petersson, 2014:221).

3.4.1.3 Subtheme 1.3: Medical practitioners experienced that the easy mobility of the device improved accuracy, efficiency and productivity with regard to clinical decision making.

The participants indicated that they experienced that the easy mobility of the device improved accuracy, efficiency and productivity with regard to clinical decision making because of the readily available information at the point-of-care. The mobility of the device allows the participants to get quick access to accurate information when needed for clinical decision making. The information that they could reliably access quickly and accurately includes information on the latest medication. Similarly, the participants expressed that they could, via mobile technology, access information to confirm specific investigations done to patients, thus, reducing unnecessary investigations and improving efficiency. The accurate information via mobile technology, with regard to clinical decision making, will have a positive effect on patients' health outcomes.

"What is the latest best medication for certain illness? All these access much quicker on mobile technology … so that the patient can recover and be back to their healthy state and be able to go home and continue with their daily activities" (P1:1).

"Without ... without doing things that you not sure of yourself. It makes it easy to just confirm and make sure you are doing the right thing…" (P4:1).

"Ja ... you know, I mean, I think that, for clinical decision-making it's harder because that's takes time and so it's good the ... the mobile thing [mobile technology] are useful … I had better, I had information available and can make better decisions with the information that I had. So it just facilitated me making good informed decisions or making the right decisions to giving the right doses and things and stuff that I needed to do … So in that, I would say at least quickly useful. Things that I wanna check very quickly but at least it kind of guide my decision-making process in ... in a more kind of profound way, and I think it obviously guide you process to some extent because when you want to try to get a small snit of information that are useful"(P8:8,9).

"Actually having the right resources on the mobile computing device can enhance decision making [thus improving efficiency and productivity]" (P9:6).

The participants felt that quick, accurate information on the mobile computing device confirmed specific investigations for the patient at the point-of-care with regard to clinical decision making. It thus prevented time wastage by requesting unnecessary investigations that are not needed and it improved productivity.

"… and also doing unnecessary investigations that is not really maybe helpful for the patient. Yes so you know exactly what thoughtful investigations to do and also in terms of management …" (P5:4).

"To get your information in a quick, accurate and very reliable way on your phone and it still stays very confidential, the results of the patient" (P1:1).

"Assisting in our clinical decision making [and accuracy and efficiency] from having updated information" (P6:3).

The participants indicated that the mobility of the device allows them to get quick and accurate information that improves efficiency with regard to clinical decision making. Having quick, reliable information related to the patients' blood results on the mobile computing device eliminates the physical collection of blood results from the laboratory to the patient's folder. Participants indicated that the available information, via mobile technology on reliable websites, facilitates informed decision making in a much more efficient way.

"I mean, it's for ward patients for efficient to have. Assisted the way which our printed results get collecting from the lab and put into the patients file because it's all there". (P9:2).

"It does assist you. Like I said in the beginning, you must always go with your physical assessment and with your knowledge but it definitely does assist you especially, for example, if you are in a small hospital alone and you don't have any senior doctors, or specialist that can assist you, you can use the internet and clinical decisions on a reliable website to help you with your best clinical decision-making. To read up on the illness quickly and to see what is the best management for that illness for the patient". (P1:4).

According to Moore & Fischer (2012:157), mobile technology clearly influences medical practitioner decision making. Hence, the nature of making effective decisions lies in making choices, which is a very complex process in patient care (Liao *et al.,* 2013:139). The complexity of clinical decision making requires a broad accurate knowledge base and access to reliable sources of information (Bjørk & Hamilton, 2011:1). Mobile technologies have reliable sources of information; in addition, they improve the overall efficiency of completing clinical tasks while also reducing medical error in the workplace (Putzer & Park, 2012:7). According to Moore & Fischer (2012:158), increased efficiency is recognised as comparative to a decrease in time.

The participants indicated that clinical information is readily available via mobile technology when consulting the patients at the point-of-care. The participants' access to information reduces time wasting activities and improves productivity. In addition, the patient's stay in the hospital is also decreased as a result of the improved quality of care, which is a consequence of the ability to make quick clinical decisions.

"You get them as soon as you need them and without wasting time, without making the patients panic in front of you" (P4:1).

"So the main thing is I think it is time saving and quality of care for your patient as improve" (P1:1).

"All these access much quicker on mobile technology, which safe time once again to give the patient the best care in the quickest time and…" (P1:1).

"It differs their time that they spent in hospital first of all…" (P5:4).

It is confirmed, by Moore & Fischer (2012:158), that mobile technology has been introduced to support medical practitioners' clinical decision making. It is for this reason that medical practitioners use mobile technology on a regular basis to access relevant clinical information to expedite patient access to appropriate care (Li *et al.,* 2012:5), thus increasing accuracy, efficiency and productivity. According to Brown & McCrorie (2015:97), the accessibility of information via mobile technology made a

dramatic improvement in the quality of patient care. Brown & McCrorie (2015:97) stated that it facilitates time saving and efficiency in patient care delivery. Marcotte *et al., (*2014:1) stated that it reduces avoidable hospital readmissions and other negative consequences for the patients, and it could reduce time wasting and therefore improve the productivity of medical practitioners. According to Liao *et al.,* (2013:138), mobile technology reduces the workload of medical practitioners, increases the time they spend directly on patients and improves the quality of healthcare.

3.4.2 Theme 2: Challenges experienced by medical practitioners related to the use of mobile technology for accessing information at the point-of-care.

The participants indicated that they experienced many challenges with regard to accessing information, via mobile technology at the point-of-care, for clinical decision making. The challenges experienced by most of the participants included technical challenges, outdated information and lack of reimbursement for their airtime. Some participants experienced the inability to access information via the mobile technology when needed, because they were unable to open the documents. The network was also sometimes a challenge, and it prevented them from accessing the required information.

"Ok my experience using that tablet ... but there are some limitations because there are ... you are ... I ... I wanted ... most of the time I want to use it access information in terms like accessing article on it but there are articles that you cannot like you cannot open" (P7:1).

"But the problem that now the network was a problem ... was the problem" (P7:3).

The challenges experienced by medical practitioners related to the use of mobile technology for accessing information at the point-of-care will be further discussed under the following sub-themes:
- Medical practitioners experienced technical challenges related to the use of mobile technology.
- Medical practitioners experienced the guidelines available on tablets to be

outdated.

- Medical practitioners experienced a lack of financial reimbursement for airtime/data used for tablets, especially when used to support clinical practice.

3.4.2.1 Sub-theme 2.1: Medical practitioners experienced technical challenges related to the use of mobile technology.

The participants experienced some technical challenges when using the mobile technology for accessing information at the point-of-care for clinical decision making. These technical challenges included the network not being readily available, network changes, slow network, some areas being more accessible to internet than others, technical support not being readily accessible and difficulty in operating the mobile technology device.

The participants expressed that the absence of access to the network at the point-of-care, hampered access to the patients' laboratory results and access to certain websites for information, when needed at the point-of-care. They could only access the preloaded guidelines and books that were loaded onto the memory card of the mobile device, when they did not have access to the network.

"At the same time, I want to access the network is not there … now so that I can access the results from wherever I am" (P7:3).

"Uhm, just like I said sometimes it wasn't the easiest because of the reception. So everything that was internet dependant because the reception wasn't always clear here and then I also had to struggle…" (P2:4).

"But like I said it was just signal dependent that was the only problem that I found maybe" (P2:2).

"No there were no websites. We just ... we had only books and guidelines. There were no website access" (P3:3).

Ganesan, Prashant & Jhunjhunwala (2012:368) stated that one of the main challenges was mobile network in the rural areas and it did not always work as expected. According to Morgan, Dix, Philips & House (2014:755), many of the apps created for mobile technology rely on the availability of strong internet connectivity.

If mobile technology is without internet access, it will not satisfy the requirements of the functions that the device is intended to support, for example, website access (Putzer & Park, 2012:2). According to Brown & McCrorie (2015:94), health care professionals desired access to tools and resources that are current and provide the opportunities for immediate access.

To add to the above-mentioned challenges, the participants indicated that the hospital network was changed to a different network; this contributed to the challenge of maintaining network access. Furthermore, the difficulty in accessing the network due to a lack of reception was specifically evident in certain wards in public hospitals and, in rural areas, because of the poor signal and quality of reception. The latter network problem thus created challenges in accessing information via the mobile technology for clinical decision making. The following quotes from the raw data of the participants highlight this:

"… and also partly [challenges were experienced] because our network things has changed" (P8:4).

"And the thing where I am at (name not mentioned). The network system is not good and it's worst with the ... with the MTN [the different network] and that thing was MTN. So most of the time we don't have the network cover … But the problem that now the network was a problem. At the same time I want to access the network is not there" (P7:2-3).

"The problems that I would have was accessing the internet, for example, because (name) hospital reception is not very good. So trying to access information via a website and stuff was not always the easiest thing to do … (participant exhale) and if you had a MTN sim card but sometimes especially in nursery and paeds there is no reception there, so that made it quite difficult. So you could not really access the internet all the time, especially on calls" (P2:2).

"Obviously one needs to get connectivity. There are issues with connectivity, especially in rural areas …" (P9:2).

According to Boase (2013:58), mobile technology is valuable because it allows internet access and web browsing which further increases the scope of possible activities for the user. Quite contrary to the foregoing statement, Brown & McCrorie

(2015:96) indicated that some of the technical aspects of accessing information via mobile technology are specifically related to the challenges of Wi-Fi and internet access. Gautham *et al.,* (2014:2) are of the same opinion that the challenge of internet connectivity in rural areas likewise holds the challenge of accessing information via mobile technology. Furthermore, Morgan *et al.,* (2014:756) also confirmed that there are problems with rural internet, particularly mobile technology access to internet in the rural areas. Therefore, a large percentage of the population cannot access the internet. It therefore stands to reason that if there is no availability of internet connectivity, medical practitioners will not be able to search for reliable information in the workplace that will support medical practitioners with efficient patient care in rural areas (Hardyman *et al.,* 2013:2).

Some participants also felt that the software on the mobile computing device was outdated and very slow; for the same reason, participants stopped using the mobile computing device to access the necessary information at the point-of-care for clinical decision making.

"…but so I don't really use it [mobile device] now anymore because I don't know the software is a little bit out of date and very slow…" (P2:4).

"You found that the network is slow it only uses 3G and... (not clear) especially when using the internet …" (P4:4).

"I mean it was never worthwhile for me and I think others had similar expenses… so that tablet is actually unusable" (P9:8).

The above-mentioned quotes are congruent with Lazzara & Weaver (2011:729) who are of the opinion that the moment users of mobile technology are dissatisfied with the experiences of interacting with their mobile devices, for example, slow and outdated software, the potential benefits of mobile devices will not effectively transfer into their daily practice. The challenges were especially found in the rural hospitals, where medical practitioners tried to provide patients with the optimal quality care whilst simultaneously tackling challenges caused by their remote geographical area and limited resources; an example of a challenge would be the slow network (Rikhotso, Williams & de Wit, 2014:5). For the same reason, mobile technology was

condemned for disconnecting healthcare workers from their surrounding spaces, which is at the point-of-care (de Souza e Silva, 2013:116).

One participant, in particular, experienced a lack of technical support which hampered the optimal use of mobile technology for accessing information at the point-of-care for clinical decision making. The participant indicated that technical failure and hardware support were limited and created a challenge to accessing information. The participant experienced challenges in having the device repaired timeously when it was faulty. The participant expressed that the latter challenges interfered with the provision of optimal quality patient care and clinical decision making at the point-of-care.

"I'm not sure that both because of hardware technicality" (P9:7).

"I also unfortunately have had a number of technical issues with my tablet … So I think that properly my experience in the study period itself was ... was totally not optimal in terms of accessing information for technical reason and then perhaps also because of the machine itself … were that getting the right research technology to hardware supported and the ... the size" (P9:1-2).

"The other story is kind of technical failure … this study illustrated some of those challenges that it pointed us down the road … That was not the first time yet and that's ... That's definitely a mission. There is limited onsite technical support and the rights on a study sample is to supply a tablet and I can't remember what bugged the first time really. The second is locked behind some sort of study... (unclear) ... so that tablet is actually unusable but the first time you didn't even getting it fixed by the client and it was a nightmare being indicated for and it was. I think there was a number of checks before it came back. That's a real problem when you, if you trying to create it as a device to rely on day to day and so ja. There are actually a number of issues with hardware support and stuff out there and to be able to stay involved with technical expertise that was involved to back it up. This was the challenging temperament because of difficulties and maintaining systems within our kind of contexts. Technically, difficulties around repair and uptime of the devices and but I

think that there is some scope for mobile technology all sorts of things take place and to make a difference to quality care of our patients" (P9:4,8).

Inadequate specification of requirements has been the number one cause of ICT project failure. To be technically successful, the technical and functional requirements of the mobile computing device must be completely and clearly specified and linked to the benefits that mobile technology is supposed to deliver, that is, to access information at the point-of-care (Lewis, Hodge, Gamage & Whittaker, 2011:11). Sadly, information technology in healthcare has failed (O'Mahony, Wright, Yogeswaran & Govere, 2014:2). Some of the technical aspects of failure in accessing information via mobile technology is specifically related to Wi-Fi and internet access issues (Brown & McCrorie 2015:96). Congruent with the research study, unsurprisingly, one of the important issues is the hidden costs associated with technology; these include maintaining, upgrading and replacing broken equipment (Lewis *et al.,* 2011:16).

Although some of the participants indicated that the training they received with regard to operating the mobile device was appropriate and adequate in assisting them in becoming confident in using the mobile computing device, some participants still experience some challenges in operating the device due to their poor computer literacy. The participants also expressed that, sometimes, the mobile computing device does not want to open for the purpose of searching information via mobile technology for clinical decision making.

"The guys who came to do the inter...Lecture to us they know …" (P4:2).

"Obviously problems come in, if you don't have a sound degree of computer literacy but using the handheld device" (P6:1).

"… just to do Snypes [to imply Skype] and I kind of worked out how things are and sometimes when I'm not sure how thing work" (P8:7).

"Like if I'm trying to access the Emedicine it wouldn't open" (P7:2).

Although medical practitioners were trained on the use of mobile technology, Ganesan *et al.,* (2012:370) suggest that the users (medical practitioners) should be given additional rigorous training in the use of the hardware and software of their mobile technology. The challenge experienced by the participants might be due to a lack of understanding of the mobile computing device and how to use the device effectively (Stern & Iadarola, 2010:22). A lack of skills in operating the mobile computing device is one of the challenges experienced during data collection (Ganesan *et al.,* 2012:369). According to Moore & Fisher (2012:158), in a research study done on healthcare information technology confirmation, it was revealed that the expense of training and updating healthcare technology is enormous.

3.4.2.2 Sub-Theme 2.2: Medical practitioners experienced the guidelines available on tablets to be outdated.

The participants indicated that they found the guidelines uploaded onto the tablets, for easy access, to be outdated. The outdated guidelines, for example, included the guidelines relating to the management of HIV/Aids and TB. The participants experienced that these outdated guidelines on the tablet have lost their clinical relevance and they restrict the practitioner in his/her ability to provide the current health care, according to the latest guidelines at the point-of-care. Moreover, new updated guidelines were not loaded onto their mobile device. The participants indicated that the guidelines were also not situated in a South African context, thus making it difficult to apply the guidelines to South African patients. This created a challenge for medical practitioners at point-of-care, as indicated by the quotations below:

"…So the research-ability of some of those things and also keeping it up-to-date of course it become very difficult because the HIV Guidelines quickly goes out of date and ... and they are not easily updateable. So you don't know where to look for them and … then they quickly become irrelevant" (P9:4).

"...and the changes too, is to make sure that it keep being updated and some of those information is a little bit older…" (P8:1).

"…there's a lot more that can be done in terms to make it electronic, in terms of making resource, protocols, guidelines in South African context more easily available for people to look through because if they are not easily available, people tend to just kind of turn on them blindly…" (P9:4-5).

"I think that's most user-friendly thing actually is critical to them to have them as a South African Medical formularies to go onto an apps that becomes available…" (P8:10).

According to Gautham *et al.,* (2014:1), clinical practice guidelines are presented in an interactive, structured, step-by-step management of common diseases, according to existing protocols. Medical practitioners with interactive guidelines preloaded on their mobile devices indicate that they improve appropriate diagnostic testing and improve the quality of diagnostic decision making at point-of-care (Mickan *et al.,* 2014:6). Increased adherence to guidelines can improve quality healthcare for the patients (O'Mahony *et al.,* 2014:1). Contradictory to the aforementioned statements, medical practitioners experienced the opposite at the point-of-care. Gautham *et al.,* (2014:2) stated that if these standardized evidence-based clinical guidelines are outdated, medical practitioners will lack adherence to them, which is regarded as a barrier to improving health care.

The participants indicated that due to the limitations they experienced, they stopped using the mobile device.

"… it doesn't do anything so I stop using it towards the end…" (P2:4).

"Ja ... I mean I haven't used those for a while because ja ... Ja ... I mean I haven't used those for a while because ja" (P8:4).

"So which was sort of like a limitation in a way … So in all I didn't use much, yes I didn't use much … Some of the things are not different from the things that I know and it was a long time ago that I last look at that thing because of limitation that I said …" (P7:2,4).

According to Lazzara & Weaver (2011:731), the use of mobile technology at the point-of-care can support and contribute to the quality and efficiency of information

needs by medical practitioners. In contrast to the above, if the mobile computing device has limitations, health-care providers are less likely to use mobile technology if they believe the system to be less effective, cumbersome, or difficult to use (Dunphy, Finlay, Lemaire, MacNaim & Wallace, 2011:365).

3.4.2.3 Sub-theme 2.3: Medical practitioners experienced a lack of financial reimbursement for airtime/data used for tablets, especially when used to support clinical practice.

Since the mobile computing devices that the participants used in the study were already preloaded with the necessary guidelines and books to support medical practitioners in clinical practice, minimal additional airtime was provided by the Department of Health for additional internet searches which would support clinical practice. One participant indicated that the allocated amount of R100 airtime was not enough and, when the preloaded data was depleted, there was no reimbursement for extra data bought by the practitioner herself. She indicated that she had to pay for her own airtime for work purposes, which she did not feel was fair; therefore, she would not use the mobile technology device for accessing information at the point-of-care.

"Yes, another thing on the tablet that was a problem. The money that the government was putting on the tablet was too little. So to add, when you access information you just needed to have data in and the data that you was putting on was a hundred rand data. So it was too little now then you have to pay your own amount money to the data. So which was sort of like a limitation in a way because now it was like not using it for the whole month … I better go to use my own phone now to access the thing on the one I'm registered to, other than paying for that one. The data...was the problem. So I said ah ah...it's not ... it's not tempting me. At the same time I want to access the network is not there and sometimes the money, the data is finished. So I didn't go to for them to load … so that I can access the results from wherever I am… Ja because of the data" (P7:1-4).

The participant expects the hospital to load extra data onto the mobile device in order to access the necessary blood results even from home

"So in all I didn't use much, yes I didn't use much because I also wanted the hospital to load so that I can access the blood results from home on it …" (P7:3).

According to Hardyman *et al.,* (2013:2), medical practitioners were provided with mobile technology that made it possible to provide immediate electronic access without the need of the internet. Archibald *et al.,* (2014:2) are of the opinion that medical practitioners were given a mobile computing device that was loaded with medical and general apps. In addition, they were given 3G enabled mobile devices and received data plans to avoid limitations to accessing online resources. While medical practitioners received the mobile computing device with all of the above mentioned resources, limited data was still experienced by the participant. According to Lewis *et al.,* (2011:13), while affordability signified an immediate problem, this will shift to issues of sustainability in the long term and, as such, realistic choices about introducing costly mobile technology in poor rural communities must be made.

Several factors were indicated as restrictive in medical practitioners' daily clinical practice in public hospitals. This study revealed one of the restrictions, identified as network inaccessibility at the hospital. One participant in the study indicated that the hospital did not pay the network within the hospital. As a result, the participant could not access information at point-of-care in order to support clinical his clinical practice.

"So again in 2014 the, our digital radio, radiography was, which have been difficult for a number of years but not really broadcasting because they did not pay the network within the hospital" (P9:3).

The findings of this study are congruent with the findings of research carried out by O'Mahony *et al.,* (2014:2), who stated that it is evident that the majority of information projects in various sectors, including healthcare, have failed due to managerial and financial issues. This notion is supported by Rikhotso *et al.,* (2014:5), who stated that district hospitals or rural hospitals, which are the catchment centres for poor communities, are operating with a constrained budget. Monetary limitations cause a major barrier in healthcare, due to its expensive hardware and the high cost of internet connectivity (Lewis *et al.,* 2011:13). In addition, cable based

internet, which is part of the challenges, is also an expensive option in healthcare (O'Mahony *et al.,* 2014:1).

3.5 CONCLUSION

This chapter addressed the results of this study and highlighted the experiences of medical practitioners with regard to accessing information via mobile technology at the point of care for clinical decision making. This chapter discussed the main themes that emerged related to the benefits and challenges that they experienced when using the mobile technology device for accessing information, for clinical decision making.

In Chapter Four, the summary, recommendations, limitations and conclusion of the study will be provided.

CHAPTER FOUR

SUMMARY, CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

4.1 INTRODUCTION

A thick description of the experiences of medical practitioners regarding the accessing of information via mobile technology for clinical decision making at public hospitals was described in Chapter Three. The focus of this chapter will be to provide a summary of the research findings and the conclusions drawn from the analysis, as well as the limitations experienced by the researcher in conducting this study. Recommendations based on the research findings and recommendations for future research, education and practice will also be put forward at the end of this chapter.

4.2 SUMMARY OF FINDINGS AND CONCLUSIONS

Following an analysis of the collected data by the researcher, in conjunction with an independent coder, two main themes and six sub-themes emerged. Medical practitioners expressed diverse experiences regarding accessing information at the point-of-care via mobile technology for clinical decision making. The main and sub-themes were compared to the relevant literature.

Theme One highlighted the benefits shared by the medical practitioners with regard to using mobile technology for accessing information at the point-of-care in clinical decision making at public hospitals. The medical practitioners indicated that they had good experience of accessing information via mobile technology at the point-of-care. The main benefits that emerged were that medical practitioners experienced improved access to information such as electronic health records, medical references, and the medical applications necessary for clinical decision making. The main clinical records that the medical practitioners had access to were patients' x-

rays and various specimen results. The participants indicated that being able to access various information sources for clinical decision making at the point-of-care, via the mobile technology, was a great asset because it improved the patient care and management they provided. Some information was pre-loaded onto their mobile devices in the form of electronic textbooks and various clinical guidelines for easy access in order to make clinical decisions. The participants also experienced the easy mobility of the device, which was marked as improving accuracy, efficiency and productivity with regard to clinical decision making and patient care. The required information was at the tips of their fingers via their mobile devices and the mobile computing device was easier to carry around than a load of books.

Theme Two highlighted the challenges experienced by the participants in accessing information at the point-of-care for clinical decision making via mobile technology. The challenges experienced by the participants included technical issues related to the use of mobile technology, outdated guidelines available on the device and a lack of financial reimbursement for airtime or data used for tablets, especially when used to support clinical practice. The technical challenges that the participants experienced included the network not being readily available, network changes, slow network, some areas being more accessible to the internet than others, technical support not being readily accessible and difficulty in operating the mobile technology device. The outdated guidelines were experienced as hampering their clinical decision making and making them lose interest in using the device. The network being unavailable was primarily experienced in the rural areas and in small public hospitals. The participants also experienced poor reception, and the resultant weak internet connection, thus making it impossible to access any results for the patients at the point-of-care. The lack of adequate airtime also hampered access to information at the point-of-care. The participants indicated that the financial resources allocated to the tablet, by government, was insufficient; the amount of data loaded to the device was worth R100. When the data on the device was depleted, participants had to use their own personal data on their mobile computing device to access the network. Thus, as indicated by the participants, it was not worthwhile to have the device because it did not do the job that it was intended to do, that is, accessing information at the point-of-care for clinical decision making.

4.3 LIMITATIONS OF THE STUDY

The following limitations were experienced by the researcher during the course of the study:

- The researcher experienced great difficulty in scheduling interview appointments with the participants because they had extremely tight working schedules. There were five interview cancellations and interviews had to be re-scheduled to accommodate the participants. This resulted in a delay in the data collection process. Healthcare authorities should be made aware of medical practitioners' tight work schedule.

- The participants always appeared to be rushed while being interviewed, thus placing pressure on the researcher to hasten the process. The quality of the interviews was hampered because the participants did not provide the most valuable knowledge about the research topic for data collection. Input from more medical practitioners in the Eastern Cape Province would be of value to this study.

- Logistically, the participants were scattered throughout the Eastern Cape Province, this made face-to-face interviewing difficult and therefore seven interviews were conducted telephonically and the lines were occasionally poor during these interviews.
  This resulted in the researcher not being able to follow the detailed description of the data being collected in the interviews. Other technological methods could have been employed for data collection; Skype is an example of this.

4.4 RECOMMENDATIONS

It is anticipated that the recommendations formulated could facilitate the use of mobile technology for accessing health information at the point-of-care for clinical decision making among other medical practitioners at public hospitals. These recommendations are based on the research findings and the literature that was reviewed for this study. They are discussed below:

4.4.1 Recommendations for practice

It is hereby recommended that in order to facilitate the use of mobile technology, by medical practitioners, for accessing information at the point-of-care in clinical decision making in order to improve the quality of patient care at public hospitals, the following should be put in place:

4.4.1.1 Internet connectivity

It is hereby recommended that internet connectivity be available 24 hours per day in all the wards or units in public hospitals, especially, in the rural areas, thus permitting medical practitioners to access information via mobile technology when necessary. Thus, all public hospitals should have access to Wi-Fi.

It is also recommended that hospital management increases the airtime available to medical practitioners so that they are not hampered in accessing information at the point-of-care. Management could embark on exploring feasible packages with service providers at a good rate for staff. This will ensure that medical practitioners have easy access to information via mobile technology for clinical decision making at the point-of-care.

4.4.1.2 Reimbursement to medical practitioners

Management should ensure that the necessary money is reimbursed to medical practitioners who used their own money to buy data on the mobile computing device in order to access information at the point-of-care. This will ensure that medical practitioners always use their mobile computing device to access information for clinical decision making at the point-of-care.

4.4.1.3 Availability of mobile technology to all medical practitioners

Since the majority of medical practitioners seek information via mobile technology for clinical decision making, it is hereby recommended that medical practitioners at public hospitals are provided with mobile technology such as iPads, smartphones or iPods for accessing information at the point-of-care. This will make it easier for medical practitioners to have easy access to all the necessary information via mobile technology for clinical decision making at the point-of-care.

4.4.1.4 Training and technical support

It is hereby recommended that medical practitioners be adequately trained on how to use mobile technology for accessing information at the point-of-care. The medical practitioners should be informed about all the features of the device so as to facilitate easy navigation when accessing information for clinical decision making. This could be implemented as part of the in-service training of medical practitioners.

It is also recommended that technical support be accessible at all times to assist the medical practitioners when encountering technical challenges with the mobile computing device. This is suggested so that medical practitioners do not lose interest in, and to encourage them to use, the mobile computing device for accessing information when needed at the point-of-care. Management needs to liaise with service providers to deliver prompt assistance when needed.

It is also recommended that medical practitioners use the 6S model for conducting information search so that they have an organised and effective approach to searching for high-quality health related information, for clinical decision making at the point-of-care.

4.4.1.5 Updated and relevant content

It is recommended that the content is kept relevant and updated regularly by a designated person, so that the information provided on the mobile computing device does not become obsolete. Management should delegate this responsibility to a person that is a competent researcher and who is able to keep abreast of the latest guidelines. In-service education should be done at regular intervals at the public hospital in order to update medical practitioners on the latest available guidelines.

4.4.2 Recommendations for education

Based on the research findings, it is hereby recommended that all medical students in the South African context receive training in this regard, so that they are competent in accessing information at the point-of-care, for clinical decision making, by the time they qualify as medical practitioners.

Hospitals can use the training department to schedule regular in-service programmes for all qualified medical practitioners; these programmes will offer training on the use of mobile technology to access information for clinical decision making. The training schedule should be circulated to all medical practitioners to ensure that all the medical practitioners will be able to schedule their time accordingly.

Public hospital training departments should also make short courses and workshops on the use of mobile technology, for accessing information for clinical decision making at the point-of-care, available to medical practitioners. Management support is essential in order to make these recommendations successful.

The Health Professional Council of South Africa could institute an additional requirement for the Continuing Professional Development (CPD) criteria, that is, a mobile technology update. Mandatory random audits can be conducted on their submit CPD portfolio to Council to ensure compliance.

4.4.3 Recommendations for research

It is recommended that further research be conducted on the impact that accessing information at the point-of-care, for clinical decision making, via mobile technology has on patients' health outcomes. In addition, further research could be conducted in order to ascertain patterns in the use of mobile technology for accessing information at the point-of-care. Similar research studies could also be conducted in other provinces in South Africa, in order to establish what the experiences of practitioners in these provinces are, in this regard.

4.5 Conclusion

This chapter described the summary and conclusions drawn as well as the limitations and recommendations of this study. In conclusion, participants expressed diverse experiences in the use of mobile technology for accessing information for clinical decision making at the point-of-care at public hospitals. Based on the research findings, several recommendations were made, including improved internet

connectivity, the availability of mobile technology to all medical practitioners, technical support/training and updated applications relevant to the South African context. Thus, the second objective of this study was accomplished.

LIST OF REFERENCES

Abbott, P. A. & Coenen, A. 2008. *Globalization and advances in information and communication technology: the impact on nursing and health*. Nursing outlook, 56 (5), 238-246.

Abubakar, A. B. & Harande, Y. I. 2010. *A Snapshot of Information-Seeking Behavior Literature in Health Science: A Bibliometric Approach*. Library Philosophy and Practice, 5(24), 1-9.

Ancer, J. 2015. *Crisis in laboratory threatens the nation's health*. Available at: http://www.mg.co.za Accessed 23 December 2015.

Archibald, D., Macdonald, C., Plante, J., Hogue, J.H.& Fiallos, J. 2014. *Residents' and Perceptors' of the use of the iPad for clinical teaching in a family medicine residency program*. BMC Medical Education, 14(174), 2-8.

Aston, L., Wakefield, J. & Mc Gown, R. 2010. T*he student Nurse Guide to Decision Making in Practice*. New York; Open University Press Publishers.

Babbie, E. 2010. *The Practice of Social Research*. 12th edition. California: Cengage learning.

Babbie, E. & Mouton, J. 2006. *The practice of nursing research. Appraisal, Synthesis and Generation of Evidence*. 6th edition. California: Saunders Elsevier Publishers.

Beal, V. 2010. *Wi-Fi Definition is Not Wireless Fidelity.* Available at: www.webopedia.com. Accessed 15 December 2015.

Benavides, S., Polen, H. H., Goncz, C. E. & Clauson, K. A. 2011. *A Systematic evaluation of paediatric medication information content in clinical decision support tool on the smartphones and mobile devices*. Information in Primary Care, 19(1), 39-46.

Boase, J. 2013. *Implications of software-based mobile media for social research.* Mobile Media & Communication, 1(1), 57-62.

Bjørk, I. T. & Hamilton, G, A. 2011. *Clinical Decision Making of Nurses Working in Hospital setting.* Open access, 1(1), 1-8.

Boruff, J. T. & Bilodeau, E. 2012. *Creating a mobile subject guide to improve access to point-of-care resources for medical students: A case study.* Journal Medical Library, 100(1), 55-56.

Botev, R., Mallie, J., Wetzels, J. F. M., Couchoud ,C. & Schuck, O. 2011. *The clinician and estimation of glomerular filtration rate by creatinine-based formulas: Current limitation and quo vadis.* Clinical journal of the American Society of nephrology, 6(4), 937-950.

Botma, Y., Greeff, M., Mulaudzi, F. M. & Wright, S. C. D. 2010. *Research in Health Science.* Pretoria: Heinemann Publishers.

Brink, H., van der Walt, C. & van Rensburg, G. 2012. *Fundamentals of Research Methodology for Healthcare Professionals.* 3rd edition. Cape Town: Juta Publishers.

Brown, J. & McCrorie, P. 2015. The iPad: Tablet Technology to Support Nursing and Midwifery Student Learning. Computer, Informatics, Nursing. 33(3), 93-98.

Burns, N. & Grove, S .K. 2011. *Understanding Nursing Research. Building & Evidence-Based Practice.* 5th edition. California: Saunders Elsevier.

Burns, N. & Grove, S. K. 2009. *The practice of Nursing Research: Appraisal, Synthesis, and Generation of Evidence.* 6th edition. California: Saunders Elsevier.

Calabretto, J., Thomas, J., Rossi, S. & Beilby, J. 2014. *Medical Students Experience of a Smartphone-Delivered Drug Information Resources.* Electronic Journal of Health Informatics, 8(2), 1-9.

Cardoso, R.B., Hutter, E., Hoppe, A., Winter, C., Celia, S., Duval, V., Lopes, M. H. I., Fernandes, J., Sparenberg, A., Adolfo, L. F. & Russomano, T. A. 2007. *A Successful Telemedicine Experience in the Brazilian Amazon Region.* Acta Informatica Medica, 15(4), 211-215.

Chan, R. & Stiedat, V. 2010. *Evaluation of three point-of-care healthcare databases: BMJ Point-of-care, Clin-eguide and Nursing Reference Centre*. Health information and Libraries Journal, 28(1), 50-58.

Chinn, P, I. & Kramer, M, K. 2011. *Integrated Theory and Knowledge Development in Nursing.* 8th edition. USA: Elsevier. Mosby.

Chokwe, M, E. & Wright, S. C. D. 2013. *Caring during clinical practice: Midwives' perspective.* Curationis 36(1), 1-7.

Classen, D.C., Resar, R., Graffin, F., Federico, F., Frankel, T., Kimmel, N., Whittington, J.C., Frankel, A., Seger, A. & James, B. C. 2011. '*Global Trigger Tool' Shows that Adverse Events in Hospitals May Be Ten Times Greater Than Previously Measured.* Health Affairs Millwood, 30(7), 1391.

Creswell, J. W. 2009. *Research design. Qualitative, quantitative, and mixed methods approaches.* 3rd edition. California: Sage.

Crowe, M. L. 2010. *Allocation of Health Care Resources at the point-of-care. An Ethical Dilemma for Health Care Providers.* The Journal of Legal Medicine, 31, 455-456.

Dee, C., Teolis, M. & Todd, A, D. 2005*. Physicians' use of personal digital assistant (PDA) in clinical decision making.* Journal of the Medical Library Association, 93, 480-486.

De Leo, G., LeRouge, C., Ceraini, C. & Niederman. F., 2006. *Websites most frequently used by physicians for gathering medical information.* Annual Medical Informatics Association, Annual Symposium Proceedings, 902.

De Souza e Silva, A. 2013. *Location-aware mobile technologies. Historical, social and spatial approaches.* Mobile Media & Communication. 1(1), 116-121.

de Vos, A. S., Strydom, H., Fouche, C. B. & Delport, C. S. L. 2011. Research at grass roots for the social sciences and human service professions. 4th edition. Pretoria: Van Schaiks Publishers.

DiCenso, A., Bayley, L. & Haynes, R, B. 2009. *Accessing preappraised evidence: fine-tuning the 5S model into a 6S mode*l. An Internal Medicine, American College of Physicians Journal Club, 151, 2-3.

Di Pietro, T. L., Doran, D. M. & McArthur, G. 2010. *Supportive decision making at the point-of-care*. Computers Informatics Nursing, 28(4), 235-240.

Doran, D. M., Haynes, R. B., Kushniruk, A., Strause, S., Grimshaw, J., Hall, L. M., Dubrowski, A., Di Pietro, T., Newman, K., Almost, J., Nguyen, H., Carryer, J. & Jedras, D. 2010. *Supporting evidence-based practice for nurses through information technologies.* Worldviews on Evidence-Based Nursing, 7(1), 4-15.

Dunphy, H., Finlay, J. L., Lemaire, J., MacNairm, I. & Wallace, J, E. 2011. *Hands-Free Communication Technology. A Benefit for Nursing.* The Journal of Nursing Administration, 41(9), 365-368.

Edwards, A. & Elwyn, G. 2009. *Shared decision-making in healthcare: Achieving evidence patient choice*. 2nd edition. New York: Oxford University Press.

Ganesan, M., Prashant, S. & Jhunjhunwala, A. 2012. *A review on challenges in the implementing mobile phone based data collection in developing countries.* Journal of health information in developing countries, 6(1), 366-374.

Gautham, M., Lyengar, M. S. & Johnson, C. W. 2014. *Mobile phone-based clinical guidance for rural health providers in India*. Health Informatics Journal. 1-14

Gerrish, K. & Lacey, A. 2010. *The Research Process in Nursing*. 6th edition. London: Blackwell Publisher Ltd.

Govindasamy, K. 2012. *Adventure tourism in the Kwazulu-Natal province: identification of hotspots and mobile knowledge*. Available at: http://uir.unisa.ac.za Accessed 23 October 2015.

Granic, A., Cukusic, M. & Walker, R. 2012. *mLearning in a Europe-wide network of schools.* Educational Media International, 46(3), 167-184.

Hardyman, W., Bullock, A., Brown, A., Carter-Ingram, S. & Mark, S. 2013. *Mobile technology supporting trainee doctors' workplace learning and patient care: an evaluation.* BMC Medical Education. 13(6), 1-10.

Harrington, L. 2014. *Health Information Technology Safety: The Perfect Storms.* Advance Critical Care. 25(2) 91-93.

Higgins, O., Sixsmith, L., Barry, M. M. & Domegan, C. 2011. *A Literature review on health information-seeking behaviour on the web: a health consumer and health professional perspective. ECDC Technical Report. Stockholm: European centre from disease prevention and control.* Available at: http://www.ecdc.europa.co.za. Accessed 10 April 2014.

Holloway, I. & Wheeler, S. 2010. *Qualitative Research in Nursing and Healthcare.* 3rd edition. Oxford: Wiley-Blackwell Publishers.

Honeybourne, C., Sutton, S. & Ward, L. 2006. *Knowledge in the palm of your hands: PDAs in the clinical setting.* Health Information and Libraries Journal, 23, 51-59.

Johannson, J., Petersson, G., Saverman, B. & Nilsson, G. 2014. *Using advanced mobile devices in nursing practice – the view of nurses and nursing students.* Health informatics Journals. 20(3), 220-231.

Johnson, C. 2008. *Nurses and the Use of Personal Digital Assistants (PDAs) at the point-of-care.* Johnson-Scroll, 1(1), 1-8.

Jones, J., Schilling, K. & Pesut, D. 2011. *Barriers and Benefits Associated with Nurses Information Seeking Related to Patient Education Needs on Clinical Nursing Units.* The open Nursing Journal, 5, 24-30.

Koole, M. L. 2009. *A Model for Framing Mobile Learning. Thesis, Centre for Distance Education, Athabasca University.* Available at: http://www.aupress.co.za. Accessed 11 September 2013.

Kvale, S. & Brinkmann, S. 2009. *Interviews. Learning the Craft of Qualitative Research Interviewing.* 2nd Edition. California: Sage.

Lasserre, L., Eley, D., Baker, P. & Kruesi, L. 2010. *Medicine students out of town but not out of touch: Use of personal digital assistants to improve access to clinical information and enhance learning at the point-of-care in the rural and remote Australia.* The Australian Journal of Rural Health, 18, 87-88.

Lazzare, H & Weaver, S, L. 2011. *Mobile Technology: The Wave of the Future to Improve Healthcare?* Proceedings of the human factors and ergonomics society 55th annual meeting. Florida, 237-256

Lewis, D., Hodge, N., Gamage, D & Whittaker, M. 2011. *Understanding the role of technology in health information systems*. Working paper series. 17, 1-28.

Li, J., Westbrook, J., Callen, J. & Georgiou, A. 2012. *The role of ICT in supporting disruptive innovation: a multi-site qualitative study of nurse practitioners in emergency departments.* Medical Information and Decision Making. 12(27)1-8.

Liao, P., Hsu, P., Chu, William., & Chu, Woei-Chyn. 2013. *Applying artificial intelligence technology to support decision-making in nursing: A case study in Taiwan.* Health Information Journal, 21(2), 137-149.

Lincoln, Y. S. & Guba, E.G. 1985. *Naturalistic inquiry.* California: Sage.

Marcotte, L., Kirtane, J., Lynn, J. & McKethan, A. 2014. *Integrating Health Information Technology to Achieve Seamless Care Transitions.* Journal patient safety, 0(00) 1-6.

Marsden, J., Stevens, S. & Ebri, A. 2014. *How to measure distance visual acuity.* Community eye health journal, 27(85), 16.

Mickan, S., Atherton, H., Roberts, N. W., Heneghan, C. & Tilson, J, K. 2014. *Use of handheld computers in clinical practice: a systematic review.* BMC Medical Information and Decision Making, 14(56),1-10.

Minges, M., Gray, V., Magpantay, E., Kelly, T., Reynolds, T., Mukim, M., Schorr, S. & Goodrick, J. 2003. *International Telecommunication Union. World Telecommunication Development Report 2003*: Access Indicator for information Society. Geneva: ITU. Available at: https://www.itu.int/wsis/.../WorldTelecomDevelopmentReport Access 14 April 2014.

Modeste, R. M. & Majeke, S. J. 2014. *Source and types of information on self-care symptom and management strategies for HIV and AIDS*. Curationis, 37(1), 1-9.

Moore, A. & Fisher, K. 2012. *Healthcare Information Technology and Medical-Surgical Nurses. The emergence of a new care partnership*. Computers, Informatics, Nursing, 30(3), 157-163.

Morgan, A., Dix, A., Philips, M. & House, C. 2014. *Blue sky thinking meets green field usability: Can mobile internet software engineering bridge the rural divide?* Local Economy. 29(6-7),750-761.

Newman, K, M. & Doran, D. 2012. *The exploration of critical care nurses' use of accumulated knowledge and information-seeking for non-routine tasks*. Doctoral dissertation. Canada, University of Toronto.

Norris, L., Swartz, L. & Tomlinson, M. 2013. *Mobile phone technology for improved mental health in South Africa: possibilities and challenges*. South African Journal of Psychology, 43(3), 379-388.

O'Mahony, D., Wright, G., Yogeswaran, P. & Govere, F. 2014. *Knowledge and attitudes of nurses in community health centres about electronic medical records*. Curationis, 37(1) 1-6.

Oxford South African School Dictionary. 2012. 3rd edition. Cape Town. Oxford University Press.

Parikh, R. 2012. *Review of the Medscape Mobile App v4.0 for iPad*. Available at: www.medgadget.com/ . Accessed 22 December 2015.

Patton, M. Q. 2002. *Qualitative Research & Evaluation Methods*. 3rd edition. London: Sage Publischers.

Pillay, C. 2010. 2009-2010 *Annual report.pdf- National Health Service Laboratory. Cambridge, Mass.* July 2010. Available at: www.nhls.ac.za/assets/files Accessed 21 December 2015.

Polit, F. & Beck, C. T. 2012*. Nursing Research: Generating and assessing evidence for Nursing practice.* 9th edition. Philadelphia: Lippincott Williams and Wilkins.

Polit, F. & Beck, C. T. 2008. *Nursing Research: Generating and Assessing Evidence for Nursing Practice.* 8th edition. Philadelphia: Lippincott Williams and Wilkins.

Putzer, G. J. & Park, Y. 2012. *Are Physicians Likely to Adopt Emerging Mobile Technology? Attitudes and Innovation Factors Affecting Smartphones Use in the South Eastern United States.* Perspectives in health information management. Spring, 1(1), 1-22.

Ricks, E. & Ten Ham, W. 2015*. Health information needs of professional nurses required at the point-of-care.* Curationis 38(1), 1-8.

Ricks, E. J. 2012. *Developing a mobile health information system for accessing information at the point of care for medical doctors and professional nurses.* Unpublished, 1-62,

Rikhotso, S. R., Williams, J. S. & de Wet, G. 2014. *Student nurses' perceptions of guidance and support in rural hospitals.* Curationis, 37(1), 1-6.

Ruxwane, N. L., Nkqubela, I., Herselman, M. E. & Conradie. D. P. 2010. *ICT application as e-health solutions in rural healthcare in the Eastern Cape Province of South Africa.* Health Information Management Journal, 39(1), 17-29.

Soltani, M. A. 2009. *Integrating a Hand Held computer and stethoscope into a Fetal monitor.* Med Educ online, 14(3), 1-4.

South Africa. 1974. *The Health Professional Act 56 of 1974.* Health Professional Council of South Africa Pretoria: Government Printers.

Standing, M. 2010. *Transforming Nursing practice. Perceptions of clinical Decision-making: a matric model.* 2nd edition, California: Sage Publishers.

Stern, C. & Iadarola, B. 2010. *Optimizing Operations Using Mobile and Wireless Technology.* Journal (American Water Works Association). 102 (1), 20-22.

Stroud, S. D., Smith, C. A. & Erkel, A. 2009*. Personal digital assistant use by nurse practitioners: A descriptive study.* Journal of the American Academy of Nurse practitioners, 21(2), 31-38.

Tennant, J, N., Shankar, V. & Dirschl, D. R. 2013. *Reliability and Validity of a Mobile Phone for Radiographic Assessment of Ankle Injuries: A Randomized Inter- and Intraobserver Agreement Study.* American Orthopaedic Foot and Ankle Society, 34 (2), 228-233.

Thomas, D. 2011. *Health Information Technology and Disparities in Quality of Care.* J Gen Intern Med, 26(10), 1084-1885.

Ventola, C. L. 2014. *Mobile Devices and Apps for Health Care Professionals: Uses and Benefits.* MediMedia, 39(5), 356-364.

Watkins, N., Kennedy, M., Lee, N. & O'Neil, M. 2012. *Destination Bedside. Using Research Findings to Visualize Optimal Unit Layouts and Health Information Technology in Support of Bedside Care.* The Journal of Nursing Administration, 42(5), 256-265.

Williams, M. G. & Dittmer, A. 2009. *Textbook on tap: Using Electronic Books Housed in Handheld Devices in Nursing Clinical Courses.* Journal of Nursing Education Perspectives, 30(4), 220-225.

Wilson, S. 2012. *PDAs in Nursing Education. Development of a Personal Digital Assistant (PDA) as point-of-care technology in nursing education.* Available at: http://www.pdacortex.co.za. Access 09 March 2012.

Worster, A. & Haynes, R. B. 2012. *How do I find a point-of-care answer to my clinical question.* Canadian Journal of Emergency Medicine, 14(1), 31-35.

ANNEXURE A

LETTER OF PERMISSION FROM DEPARTMENT OF RESEARCH COMMITTEE AND FACULTY POSTGRADUATE STUDIES COMMITTEE (FPGSC)

**Nelson Mandela
Metropolitan
University**

for tomorrow

Dr D.G. Morton
Summerstrand North Campus
Department of Nursing Science
Tel. +27 (0)41 504 3669
Fax. +27 (0)41 504 1521

29 August 2014

Dear Ms van Rooyen

Re: Departmental Research Committee Masters Proposal Report

We are pleased to inform you that your proposal has been accepted and approved by the Department of Nursing Science's Research Committee.

Please note that this approval will only come into effect on condition that you make the changes recommended by the committee and that these have been shown to your respective supervisors. The changes that you are requested to make follow this letter.

Your supervisors will be required to send me a letter by email to inform me that the changes have been correctly implemented.

The DRC grants ethics approval and your reference number is: DRC14-NUR-17. We wish you well with your study and look forward to reading your results.

Kind regards,

Dr D.G. Morton

Research Coordinator
Department of Nursing Science
Summerstrand Campus (North)
Nelson Mandela Metropolitan University
Tel. +27 (0)41 504 3669
Fax. +27 (0)41 504 2616
David.Morton2@nmmu.ac.za

29 August 2014   Page 1

Copies to:
Supervisor/Promoter: Prof E Ricks
Co-Investigator/s: Dr P Jordan

Contact person: Ms N Isaacs

24 October 2014

Student number: 212429930

MS A VAN ROOYEN
33 MAIN ROAD
BETHELSDORP
PORT ELIZABETH
6059

RE: OUTCOME OF PROPOSAL SUBMISSION

QUALIFICATION: MCur (Research)

FINAL RESEARCH/PROJECT PROPOSAL:
EXPERIENCES OF MEDICAL PRACTITIONERS REGARDING THE ACCESSING OF
INFORMATION AT THE POINT OF CARE VIA MOBILE TECHNOLOGY FOR CLINICAL DECISION
MAKING AT PUBLIC HOSPITALS

Please be advised that your final research project was approved by the Faculty Postgraduate Studies
Committee (FPGSC) subject to the following amendments/recommendations being made to the
satisfaction of your Supervisor/s:

COMMENTS/RECOMMENDATIONS

1. Title is very long. Proposal is well written
2. Reference list should not be numbered in the Table of Contents.
3. Page 18: Correct the phrase: "article will be publication"
4. Page 19: Time schedule – data collection from Nov to Jan 2014? Correct the years.
5. Page 20: Budget adds up to R14300 (check)
6. Appendices: Letters should be dated.
7. Appendix G: "Reregistered" for the degree? Meaning?
8. Ethics form
   1 (d) Remove "Specify here, if other"
   1 (n) Findings of pilot study will form part of main study – it should be
         qualified by a statement that syas only of there are no major changes
         to be made.
   4 (e) Correct the typing mistakes.
9. Time schedule to be corrected.

Faculty Postgraduate Studies Committee (FPGSC) reference number: is **H14-HEA-NUR-017**

Please be informed that this is a summary of deliberations that you must discuss with your Supervisor/Promoter.

Please forward a final electronic copy of your appendices, proposal and REC-H form to the Faculty Postgraduate Studies Committee (FPGSC) secretariat.

We wish you well with the project.

Kind regards

Ms M Afrikaner
FPGSC Secretariat
Faculty of Health Sciences

ANNEXURE B

LETTER OF PERMISSION TO CONDUCT RESEARCH AT EASTERN CAPE HOSPITALS

APPENDIX B

The Assistant Director
Port Elizabeth Public Hospital
Dora Nginza Hospital
Eastern Cape Province

Dear Sir/Madam

<u>A REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY:</u>

I hereby seek your permission to conduct the above research at your institution among the medical practitioners, under your jurisdiction. I am currently registered for the degree Magister Curationis Research in the Department of Nursing Science, Faculty of Health Science, at the Nelson Mandela Metropolitan University, Port Elizabeth. The study is being conducted under the supervision of Prof E. Ricks and Prof P. Jordan.

The title of my research is: "The experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at a public hospital". The research will be based on a qualitative, exploratory, descriptive and contextual research design. The purpose of the study is to explore and describe the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology.

The proposal will be presented at our NMMU Health Science's Faculty Postgraduate Studies Committee (FPGSC) for ethical approval. You may contact my supervisors if there are any ethical concerns related to the study. A copy of the proposal will be made available to you for your perusal on request.

Thanking you.

Yours faithfully
Annesty E. Van Rooyen
Master student
Student No. 212429930

Cell: 073 454 2909

Email: annesty.vodamail.co.za

02 December 2014

Ms. A. Van Rooyen

Via email: Felicia. Hendricks@ECHEALTH.GOV.ZA

Dear Ms. Van Rooyen

Re: REQUEST FOR PERMISSION TO CONDUCT RESEARCH AT DORA NGINZA HOSPITAL

"*Experience of medical practioners regarding the accessing of information at the point of care via mobile technology for clinical decision making at public hospital*"

Your request received at this office 21 November 2014 refers.

Authorisation is herewith granted to do your research at Dora Nginza Hospital.

You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality at all times.

On conclusion of your study, a research report detailing your findings and recommendations is to made to the hospital.

May I take this opportunity to wish you success with the research?

DR. BG. MBULAWA-HANS

CLINICAL GOVERNANCE MANAGER

DR. NN. QANGULE

ACTING CHIEF EXECUTIVE OFFICER

ANNEXURE C

LETTER FOR PERMISSION FROM THE NELSON MANDELA HEALTH DIRECTORATE.

APPENDIX C

The Assistant Director

Port Elizabeth Public Hospital

Livingstone Hospital

Eastern Cape Province

Dear Sir/Madam

<u>A REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY:</u>

I hereby seek your permission to conduct the above research at your institution among the medical practitioners, under your jurisdiction. I am currently registered for the degree Magister Curationis Research in the Department of Nursing Science, Faculty of Health Science, at the Nelson Mandela Metropolitan University, Port Elizabeth. The study is being conducted under the supervision of Prof E. Ricks and Dr P. Jordan.

The title of my research is: "The experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at a public hospital". The research will be based on a qualitative, exploratory, descriptive and contextual research design. The purpose of the study is to explore and describe the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology.

The proposal will be presented at our NMMU Health Science's Faculty Postgraduate Studies Committee (FPGSC) for ethical approval. You may contact my supervisors if there are any ethical concerns related to the study. A copy of the proposal will be made available to you for your perusal on request.

Thanking you.

Yours faithfully

Annesty E. Van Rooyen

Master student

Student No. 212429930

Cell: 073 454 2909 Email:

annesty.vodamail.co.za

Eastern Cape Department of Health

Enquiries:	Zonwabele Merile	Tel No:	040 608 0830
Date:	18ᵗʰ November 2014	Fax No:	043 642 1409
e-mail address:	zonwabele.merile@impilo.ecprov.gov.za		

Dear Ms A van Rooyen

Re: Experiences of medical practitioners regarding the accessing of information at the point of care via mobile technology for clinical decision making at public hospitals

The Department of Health would like to inform you that your application for conducting a research on the abovementioned topic has been approved based on the following conditions:

1. During your study, you will follow the submitted protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.

2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.

3. The Department of Health expects you to provide a progress on your study every 3 months (from date you received this letter) in writing.

4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Epidemiological Research & Surveillance Management. You may be invited to the department to come and present your research findings with your implementable recommendations.

5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

DEPUTY DIRECTOR: EPIDEMIOLOGICAL RESEARCH & SURVEILLANCE MANAGEMENT

ANNEXURE D

REQUEST FOR PERMISSION TO CONDUCT RESEAERCH

APPENDIX D

The Assistant Director
Port Elizabeth Public Hospital
Provincial Hospital Port Elizabeth
Eastern Cape Province

Dear Sir/Madam

<u>A REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY:</u>
I hereby seek your permission to conduct the above research at your institution among the medical practitioners, under your jurisdiction. I am currently registered for the degree Magister Curationis Research in the Department of Nursing Science, Faculty of Health Science, at the Nelson Mandela Metropolitan University, Port Elizabeth. The study is being conducted under the supervision of Prof E. Ricks and Prof P. Jordan.

The title of my research is: "The experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at a public hospital". The research will be based on a qualitative, exploratory, descriptive and contextual research design. The purpose of the study is to explore and describe the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology.

The proposal will be presented at our NMMU Health Science's Faculty Postgraduate Studies Committee (FPGSC) for ethical approval. You may contact my supervisors if there are any ethical concerns related to the study. A copy of the proposal will be made available to you for your perusal on request.

Thanking you.
Yours faithfully

Annesty E. Van Rooyen
Master student
Student No. 212429930

Cell: 073 454 2909

Email: annesty.vodamail.co.za

ANNEXURE E

PARTICIPANTS INFORMATION

APPENDIX E

Faculty of health Sciences
Department of Nursing Sciences
NMMU
Tel: +27 (0)41 481 3662 Cell: 073 454 2909
E-mail: annesty.vodamail.co.za

Dear Participant

You are being asked to participate in a research study. I will provide you with the necessary information to assist you to understand the study and explain what would be expected of you (participant). These guidelines would include the benefits and your rights as the study respondents. Please feel free to ask the researcher to clarify anything that is not clear to you.

The researcher is conducting a study aiming to explore and describe the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at public hospitals. The researcher will use the results together with an in-depth literature search to make recommendations to enhance the knowledge of the medical practitioners at the point of care for clinical decision making. To participate it will be required of you to provide a written consent that will include you signature, date and initials to verify that you understand and agree to the condition.

You have the right to query concerns regarding the study at any time. Immediately report any new problems during the study, to the researcher. Telephone numbers of the researcher are provided. Please feel free to call these numbers. In addition, it is important that you are aware that the ethical integrity of the study has been approved by NMMU Health Science's Faculty Postgraduate Studies Committee (FPGSC). Participation in research is completely voluntary. You are not obligated to take part in any research. If you do partake, you have the right to withdraw at any given time, during the study without penalty. Although your identity will at all times remain confidential, the results of the research study may be presented at scientific conferences or in specialist publications.

Yours sincerely

A.E. Van Rooyen

APPENDIX E

Nelson Mandela Metropolitan University.

Information and Informed Consent Form.

<table>
<tr><td colspan="3"><u>**RESEARCHER'S DETAILS**</u></td></tr>
<tr><td>**Title of research Project:**</td><td colspan="2">Experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at public hospitals.</td></tr>
<tr><td>**Principal investigator**:

Address, postal code and Contact Telephone No:(private number not advisable)</td><td colspan="2">Annesty Van Rooyen
33 Main Road, Bethelsdorp, Port Elizabeth.6059
0734542909</td></tr>
<tr><td colspan="3" align="center">**A. DECLARATION BY PARTICIPANT OR ON BEHALF OF PARTICIPANT:**</td></tr>
<tr><td>**I the participant and the undersigned:**</td><td>(Full name)</td><td>**Initial**</td></tr>
<tr><td>**I.D. Number:**</td><td></td><td></td></tr>
<tr><td>**Name of Institution:**</td><td></td><td></td></tr>
<tr><td colspan="3">**A.1.HEREBY CONFIRM AS FOLLOWS**</td></tr>
<tr><td colspan="2">**I the participant, was invited to participate in the abovementioned research project.**</td><td></td></tr>
<tr><td>**That is being undertaken by**</td><td>Annesty Van Rooyen.</td><td></td></tr>
<tr><td colspan="3">**THE FOLLOWING ASPECTS HAVE BEEN EXPLAINED TO ME, THE PARTICIPANT**</td></tr>
<tr><td>**2.1. Purpose:**</td><td>The researcher is exploring and describing the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology.
The information will be used to:
Develop recommendations that could assist other medical professionals to access information at the point of care for clinical decision making via mobile technology.</td><td>**Initial**</td></tr>
<tr><td>**2.2 Procedures:**</td><td>I understand that the questions the researcher</td><td>**Initial**</td></tr>
</table>

	expect me to answer will be answered as honest as possible.	
2.3 Risks:	No risks.	**Initial**
2.4 Possible benefits:	As a result of my participation in this study the information obtained will add to a body of clinical related information at the point of care via mobile computing devices .	Initial
2.5 Confidentiality:	My identity will not be revealed in any discussion, description, or scientific publication by the investigator.	**Initial**
2.6 Access to findings:	I will have no personal access to findings.	**Initial**
2.7.Voluntary participation/refusal/ discontinuation:	My participation is voluntary.	**Initial**
3. THE INFORMATION WAS EXPLAINED TO ME/THE PARTICIPANT BY:		
Annesty Van Rooyen		
I was given the opportunity to ask questions and all my questions were answered satisfactory		
4. No pressure was exerted on me by the researcher to consent and to participate in the research. I understand that I may withdraw at any stage without penalty.		**Initial**
5. Participation in this research won't result in any additional cost to me.		**Initial**
A.2. I hereby consent Voluntary to participate in the above mentioned project.		
Signed/Confirmed at _____(Institution) on _____2014	**Signature of Participant**	
B. STATEMENT BY OR ON BEHALF OF INVESTIGATOR		
1. Annesty Van Rooyen declare that: I have explained the information given in this document to:	Name of participant: _____	
2.He/she was given ample time to ask me any questions; Yes____ No_____		
3. The conversation was conducted in English.	Yes_____ No_____	
4. I have detached Section F and handed it to the participant.	Yes_____ No_____	

| Signed/confirmed at_____ on _____2014. |
| Signature of interviewer. |

ANNEXURE F

PARTICIPANTS DECLARATION

APPENDIX F

Nelson Mandela Metropolitan University.

DECLARATION BY PARTICIPANT OR ON BEHALF OF PARTICIPANT.

RESEARCHER'S DETAILS		
Title of research Project:	Experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at public hospitals.	
Principal investigator: **Address, postal code and Contact Telephone No**:(private number not advisable)	Annesty Van Rooyen 33 Main Road, Bethelsdorp, Port Elizabeth.6059 0734542909	
A. DECLARATION BY PARTICIPANT OR ON BEHALF OF PARTICIPANT:		
I the participant and the undersigned:	(Full name)	**Initial**
I.D. Number:		
Name of Institution:		
A.1.HEREBY CONFIRM AS FOLLOWS		
I the participant, was invited to participate in the abovementioned research project.		
That is being undertaken by	Annesty Van Rooyen.	
THE FOLLOWING ASPECTS HAVE BEEN EXPLAINED TO ME, THE PARTICIPANT		
2.1. Purpose:	The researcher is exploring and describing the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology. The information will be used to: Develop recommendations that could assist other medical professionals to access information at the point of care for clinical decision making via mobile technology.	**Initial**
2.2 Procedures:	I understand that the questions the researcher	**Initial**

	expect me to answer will be answered as honest as possible.	
2.3 Risks:	No risks.	**Initial**
2.4 Possible benefits:	As a result of my participation in this study the information obtained will add to a body of clinical related information at the point of care via mobile computing devices .	Initial
2.5 Confidentiality:	My identity will not be revealed in any discussion, description, or scientific publication by the investigator.	**Initial**
2.6 Access to findings:	I will have no personal access to findings.	**Initial**
2.7. Vol participation/refusal/ discontinuation:	My participation is voluntary.	**Initial**

3. THE INFORMATION WAS EXPLAINED TO ME/THE PARTICIPANT BY:	
Annesty Van Rooyen	
I was given the opportunity to ask questions and all my questions were answered satisfactory	
4. No pressure was exerted on me by the researcher to consent and to participate in the research. I understand that I may withdraw at any stage without penalty.	**Initial**
5. Participation in this research won't result in any additional cost to me.	**Initial**
A.2. I hereby consent Voluntary to participate in the above mentioned project.	

Signed/Confirmed at _____(Institution) on _____2014	**Signature of Participant**

B. STATEMENT BY OR ON BEHALF OF INVESTIGATOR		
1. Annesty Van Rooyen declare that: I have explained the information given in this document to:	Name of participant: _____	
2.He/she was given ample time to ask me any questions;	Yes____	No_____
3. The conversation was conducted in English.	Yes_____	No_____
4. I have detached Section F and handed it to the participant.	Yes_____	No_____

Signed/confirmed at_____ on _____2014.

Signature of interviewer.

ANNEXURE G

REQUEST TO CONDUCT RESEARCH-DEPARTMENT OF HEALTH

BISHO

APPENDIX G

The Eastern Cape Research Directorate

Department of Health

Bisho

Dear Sir/Madam

A REQUEST FOR PERMISSION TO CONDUCT A RESEARCH STUDY:

I hereby seek your permission to conduct the above research at your institution among the medical practitioners, under your jurisdiction. I am currently registered for the degree Magister Curationis Research in the Department of Nursing Science, Faculty of Health Science, at the Nelson Mandela Metropolitan University, Port Elizabeth. The study is being conducted under the supervision of Prof E. Ricks and Prof P. Jordan.

The title of my research is: "The experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology at public hospitals". The research will be based on a qualitative, exploratory, descriptive and contextual research design. The purpose of the study is to explore and describe the experiences of medical practitioners with regard to accessing information at the point of care for clinical decision making via mobile technology.

The proposal will be presented at NMMU Health Science's Faculty Postgraduate Studies Committee (FPGSC) ethical approval. You may contact my supervisors if there are any ethical concerns related to the study. A copy of the proposal will be made available to you for your perusal on request.

Thanking you.

Yours faithfully

Annesty E. Van Rooyen

Master student, Student No. 2122429930

Cell: 073 454 2909,

 Email: annesty.vodamail.co.za

ANNEXURE H

INFORMATION TO THE INDEPENDENT CODER

Mrs M. Williams
NMMU
Port Elizabeth
6001

Re: Independent coding details

Thank you for agreeing to do my independent coding of the transcribed interviews conducted for my research. Please find the attached transcriptions of the nine interviews to be analysed.

The proposed steps used by Tesch as cited by Creswell (2009:186-187) were applied to analyse the data. The data was organized and prepared for analysis by having the interviews transcribed, reviewing the field notes and sorting the data.

The steps researcher and the independent coder proceeded to accomplish the following:

- Get sense of the whole by reading all the transcriptions were carefully. Ideas as they came to mind write them down in the margin.
- Pick one document at a time. Go through it to get clarity, not thinking about the substance of the information but rather of the underlying meaning of the transcribed data.
- Cluster similar topics and form them into columns that may be arranged as major topics, unique topics and leftovers.
- Abbreviate the topics as codes and write the codes next to the appropriate segments of the text to see if new categories and codes emerge.
- Find the most descriptive wording for your topic and turn them into categories. Look for ways to reduce your total list by grouping topics that relate to one another. Lines could be drawn between categories to show interrelationship.
- Make a final decision on the abbreviation for each category and arrange these codes in alphabetical order.
- Assemble the data material belonging to each category in one place and perform a preliminary analysis.
- Existing data can be re-coded when considered necessary.

Thank you for your assistance.

Kind regards

Annesty Van Rooyen

ANNEXURE I

TRANSCRIPTION OF INTERVIEW

INTERVIEWER:

Ok Dr (name not mentioned) If I can just repeat my one question again, the first one:

"T*ell me, about your experiences in accessing information at the point of care using mobile technology?"*

PARTICIPANT:

So I think basically the few things that I do so ... I mean well ... our hospital is wired to give x-rays on IPads and IPhone you should know which.

INTERVIEWER:

Yes

PARTICIPANT:

So that the first way that I access, have technology because that makes it makes ... the x-ray available wherever I am in the hospital and it means that I don't have to find and x-ray or find a (unclear). I just can go to my phone or look on an IPad and that obviously extremely convenient and it makes life a lot easier and also saves time because I don't have to find an x-ray or find a place to look for an x-ray and the patient to come back to me.

So ... so that my first thing to use mobile technology and in terms of access information. We also, the way they set up our hospitals they have access on... on to the network brrrip and so we can access it by going in and accessing that's right and ... and there is a few documents although and the changes too, is to make sure that it keep being up dated and some of those information is a little bit older but there is a ... there is a few handbooks and things that are on there that are useful.

INTERVIEWER:

Ok

PARTICIPANT:

And then ... and then obviously the third way that I access information on my mobile is to ... is by accessing the internet and so during ... getting on to the internet means

I can do two things. The one thing is that I can access lab results through the internet LABTRACK system and that is also obviously very useful wherever I am, I can check results for my patients on that system.

And the second thing is to use the resource or getting information and I ... I ... I basically use the ... the app ... application I use an app on my phone, MEDSCAPE app, which is the one, the only one that I use the most, which is you know very useful to get information. That was very good specific in the South African context but it is fine. And then there is also three other app's that I use one of them ...

Can you hear me ok (Participant are driving).

INTERVIEWER:

I can hear you doctor.

PARTICIPANT:

Ok good, the ... the other app that I use. The one app it's the one that help me with just merely medical calculations. The one that helps me to work out GFR. It help me to work out the date of the mother about to give birth and a few other thing. So it's just a simple calculating tool that helps me with some calculations that I need to do in my medical practice.

Then the second app that I used its one for eye, called the Bulla eyes app. Which is the one that a South African doctor has developed. It helps me to do eye test as a mobile and ... e ... e ... Snellen chart that I can test the visual acuity based on that. So ja the ... the ... the phone has become more and more useful I mean and mobile technology has become more useful for me to actually to do the work that I do.

INTERVIEWER:

Ok ... ok doctor do you mind if I'm just gonna ask a few thing about the things that you were saying.

PARTICIPANT:

Sure

INTERVIEWER:

You said on the mobile phone that you were using, you talked about handbooks, can you elaborate a little bit on the handbooks that you used, or the type of handbooks that you used.

PARTICIPANT:

Ja, so the hand books that I used are one's that are basically in PDF file on the network or on my phone or net because they basically just books that are being digitalise and I can access using ... using the internet or using my phone basically, and so ja. So they are both PDF handbooks. One of them is the Eastern Cape handbook of Medicine and the other one is the Cecelia hospital handbook which is one that is through the in house document that we use for our … for our ... the hospital.

INTERVIEWER:

Ok ... is were those the only books that were on the device that you were using?

PARTICIPANT:

I think there's also the ... I'm trying to think ... the others. I mean I ... I. Are you taking about the I the little book or (Very unclear, participant driving in one of the cities).

INTERVIEWER:

Ja ... the app ...The ... the (unclear) ok ...

PARTICIAPNT:

Very unclear

INTERVIEWER:

The device that you were using ... (Very unclear)

PARTICIPANT:

I'm sorry ... I hope you were talking about the I ... the little hand out tablet ... hey.

INTERVIEWER:

I'm talking about that also and the new thing that you are using now.

PARTICIPANT:

Ja ... I mean I haven't used those for a while because ja. Mine unfortunately got stolen when I had a house ... house break in.

INTERVIEWER:

Ok

PARTICIPANT:

and so ... and also partly because our network things has changed. The department of health gave us a different system and they gave us an IPad to be able to link us into the hospital network. So ... so I think most people haven't used it for a while. But I ja, the challenging thing, I mean things, that is some of the handbooks also. You need to learn the handbook quite well for it to be useful.

INTERVIEWER:

uhm

PARTICIPANT:

And so the two handbooks that I have used in PDF format, I have had in paper format first. I know where to get stuff.

INTERVIEWER:

Ok

PARTICIPANT:

But if you want a PDF format without knowing the document very well, it can be quite laborious to get things and you need. I think there is benefits ... I think that the most useful thing are actually app that are current and creative to work quickly and efficiently to get you the information that you need. Having app with or document with an accredited facility are very useful ... because you don't have much time communicating, pleading trying to find enough information ... and I think ... so the one thing that I've learned. It quite useful to be aware of.

Ok, doctor then I also want to come back to. You said that you also have handbooks that you used and also ... what website that you used also ... for ... on the mobile device?

PARTICIPANT:

So ... so they ... ja the two handbooks is the Easter Cape handbooks, the Eastern Cape Medicine. It a handbook done ... made by Doctor Parrish. Written specific for the Eastern Cape and then the others ... as I said the hospital virtually, the hospital handbook which is, we kind of put together both through (Dr name unclear) at our hospital. Then the third ... and then the ... I can't actually tend to go to websites as much as, use an app on my phone which is the MEDSCAPE app which is ... it is an app that sort of searchable and useful from a ... it kind of find information required awhile. As I said it's not that specific in the South African context. So it not always that useful to my setting but it does give me the specific drug dose like that and find it very useful and that's very hard.

INTERVIEWER:

The usefulness that you talk about ... drug information and then and you also talked about your Snellen test, Bulla eye excreta. Is there ... was there any other way that it was also useful for you? Or can you elaborate a little bit more on the usefulness of the device.

PAUSE:

PARTICIPANT:

Uhm ... so ja ... I mean I think that both of these were fairly useful. I mean the thing at a time.

 (I hope that you not gonna loose me because I'm about to go in. I can Phone you back)

Can you still hear me?

PARTICIPANT IN DRIVING

117

INTERVIEWER:

I can still hear you doctor.

PARTICIPANT:

Ok, I'm just trying to park somewhere (participant driving) so it might be that I'm going into parking at the garage. It might be a little bit, the reception might not be that great but ... Is it still ok?

INTERVIEWER:

It's still ok doctor. I can, I can still hear you.

PARTICIPANT:

Ja, so I think that ... ja I mean basically it. An app is not that useful if it takes to much time because you have ... you have a limited amount of time with your patient and you don't want to spend a long period of time looking through things. So the apps that worked well are the ones that getting you information quickly and so the two apps that I used that I like are the Snellen chart and the ... and ... ja the Snellen chart, the ...

PAUSE

INTERVIEWER:

Medicine calculation you said

PARTICIPANT:

And the ... Medicine ... Ok I'll phone you back just now.

INTERVIEWER:

Thanks doctor, its fine

PARTICIPANT:

Sorry Goo buy

(Participant received a phone call but returned a call again).

INTERVIEWER:

I just want to find out from you, what problems did you experiencing. You name a few problems. If you can think of more problems or hinderness that with the device.

PARTICIPANT:

Are you specifically speaking specifically of the device the tablet hey?

INTERVIEWER:

Ja, specific problems when using the device.

PARTICIPANT:

I'm mean I think it was just fine. You know, it was at that stage. Obviously devices got better and the operations got better but that wasn't the most easy to use operating system and partly just because I'm more used to the ... the ... I'm also used to the Android and my cells but I think on the whole it was functional when it did its job. So no major problems just to do Snypes and I kind of worked out how things are and sometimes when I'm not sure how thing work. That's the main thing.

INTERVIEWER:

Was that the main ... problem? You also talked about you using the phone when getting information at the bedside ... and you were talking about getting lab results. Can you a little elaborate on this also if you don't mind?

PARTICIPANT:

Yes so I mean we now have access to lab results on the internet and that mean that I am able to ja to get ... if I ... access I can get lab results through the NHLS lab system and so that means a huge difference because that means I can access lab results wherever I am.

INTERVIEWER:

Was ... was it only blood results doctor

PARTICIPANT:

Uhm ... blood results, sputum results, histology results. Pretty much all the results on the lab system I'm able to get hold of.

INTERVIEWER:

Ok ... you were talking about or can I just ask you. Was there anything that on the device for medicine, or perhaps medicine safety excreta that you can access?

PARTICIPANT:

You know I think there was I don't but I was not using it very much.

INTERVIEWER:

Ok

PARTICIPANT:

Ja

INTERVIEWER:

The device did it improve the quality care of the patient? Did it improve your work as a doctor?

PARTICIPANT:

I mean it definitely help with the work that I did.

INTERVIEWER:

Ok how did it help with the patient ... the care of the patient? If you can tell me a little bit more about that?

PARTICIPANT:

I had better, I had information available and can make better decisions with the information that I had. So it just facilitated me making good informed decisions or making the right decisions to giving the right doses and things and stuff that I needed to do.

INTERVIEWER:

And can I ask, did it improved the quality of care for the patient?

PARTICIPANT:

Ja I think as a result of that it also improve the quality of care ... yes

INTERVIEWER:

Can I just... just the second question?

T*ell me, about your experiences in using mobile technology for clinical decision-making?*

If you can still add something on that.

PARTICIPANT:

Ja ... you know, I mean, I think that, for clinical decision-making it's harder because that's takes time and so it's good the ... the mobile thing are useful. It's useful as a reference. It's useful ... if I know what I'm looking for and I try look it up quickly, its useful. For the kind of more complex clinical decision making I think it's a bit too ... I mean if think you would have an Apple. Something that is designed specifically to kind of have thing invented than it's a different story and so.

Sorry ... sorry somebody is just trying to phone me just one second

PAUSE (participant is busy on his phone with somebody)

INTERVIEWER:

Doctor ...

PARTICIPANT:

Ok so we were. I was saying so clinical decision making is obviously sort of a more complex process and that takes time.

INTERVIEWER:

Ok

PARTICIPANT:

And ... and ... ja. So I didn't find it that useful. I mean you can use it as a resource but usually even if I had books available with the patient. I came to, not have the time in my context, sit and look through things and try to make up my mind about something. I might phone someone for advice, I might to chat to a colleague ... but ... but to look thing up.   There is seldom the time, that in my context to be able to do that. So in that, I would say at least quickly useful. It is useful for quick fast thing I know. Things that I wanna check very quickly but at least it kind of guide my decision-making process in ... in a more kind of profound way, and I think it obviously guide you process to some extent because when you want to try to get a small snit of information that are useful. On a larger scale is less likely to do that.

INTERVIEWER:

So are you telling me the time, is it time saving not time saving?

PARTICIPANT:

Ja (laughing) I'm mean I think it's probably not that, time saving I mean it's because it doesn't mean that you spent more time looking at your phone and but ... but at the same time it ... it's does ... it is obviously the same as patient time giving them better care. From that perspective it was good.

INTERVIEWER:

Ok, doctor if I ... do you have anything to add on for me ... anything that you want to elaborate more one?

PARTICIPANT:

I'm actually, my basic thing is, what's so nice about that it makes you able to have many more resources available because it's obvious a small thing but instead of carrying a whole bag of books you can have just a few small thing available or one small thing available and I think there is a huge scope for making a user-friendly applications available but that , that will guide, make useful guided things and I think that's most user-friendly thing actually is critical to them to have them as a South African Medical formularies to go onto an apps that becomes available. So I mean I think that there are certain things that work better and certain thing that don't work so

well. I think it is as a whole it has some great potential for approved care and improve facilitation of doctors by the bedside.

INTERVIEWER:

So do you think that they need to improve the mobile that you people were using ... is there something else that you suggest that they need to upgraded it or something

PARTICIPANT

Ja I think that properly the most useful, having app that are really kind of quite functional and simple and quickly to use. I think the most important thing ... and whatever you do and whatever you put on for as a resource must have a very good surge function so that you can get the information that you need quickly without having to try and find it in a large digital document.

INTERVIEWER:

Ok is there nothing else that you want to add or anything else that you want say?

PARTICIPANT

Thank you for chatting

INTERVIEWER:

Just hold on doctor, I'm gonna put the audio-tape off.

ANNEXURE J

LETTER FROM EDITOR

Nelson Mandela
Metropolitan
University

for tomorrow

07 January 2016

To Whom it May Concern

I herewith confirm that I have proofread the following thesis:

Title of study: *Experiences of medical practitioners regarding the accessing of information at the point-of-care via mobile technology for clinical decision making at public hospitals*

Student Name: Annesty Van Rooyen

Student Number: 212429930

Qualification: Magister Curationis

I suggested relevant changes, where I saw fit, using the "Track Changes" function in MSWord; the student could thus either accept or reject the suggested changes at her own discretion.

I trust that this is in order.

Kind regards,

Nancy Morkel
MA English (NMMU), PGDHET (UFH), BA Hons English (UPE), BA MCC (UPE),
Editing Methodology (SUN).
nancy.morkel@nmmu.ac.za