

Nurses' knowledge, attitude and barriers towards pressure ulcers' prevention in two referral hospitals in Botswana

A Tshiamo

 **[orcid.org/ 0000-0003-0187-8504](https://orcid.org/0000-0003-0187-8504)**

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Supervisor: Dr S Scholtz

Co-supervisor: Prof C S Minnie

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DECLARATION

I, Akanyang Tshiamo, hereby affirm that this study: **Nurses' knowledge, attitude and barriers towards pressure ulcers prevention in two referral hospitals in Botswana**, is my personal original work and that all sources used or cited have been precisely reported and acknowledged by full references. This dissertation has not been formerly submitted in its entirety or partially by me or any other individual for degree purposes at this or any other University.

Full names

Akanyang Tshiamo

Date 07 December 2020



Signature

Student number 29301173

DEDICATION

I dedicate this thesis to all nurses in Botswana who are serving the nation with compassion, love and courtesy despite the challenges in the nursing fraternity which include a lack of resources, high workload, harsh working conditions and a lack of accommodation, but continued being steadfast, loyal, faithful and above all dedicated to their nursing principles and calling.

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ABSTRACT

Background: Pressure ulcers (PUs) are outlined as a localised injury to the skin and underlying tissue typically over a bony prominence as a consequence of pressure or pressure in combination with shear or friction (Black *et al.*, 2007:148; Moore & Cowman, 2014:2; Dealey *et al.*, 2015:309). Awareness and positive attitudes are essential to provide effective pressure ulcers' prevention (Kaddourah *et al.*, 2016:1). There is insufficient data in Botswana about pressure ulcers' prevention, hence the need for this study, which aimed to investigate nurses' knowledge, attitudes and barriers towards the prevention of pressure ulcers in Botswana. Nurses in Botswana should implement evidence-founded care for pressure ulcer prevention. Referral hospitals in Botswana are used as academic hospitals. Therefore, more information was needed to comprehend how nursing care in these institutions can be developed. The study took place in two referral hospitals in Botswana.

Objectives: There is a lack of evidence on nurses' knowledge, attitudes and barriers towards pressure ulcers prevention in Botswana. The aim of the research was to describe nurses' knowledge, attitudes and barriers towards pressure ulcers prevention in two referral hospitals in Botswana.

Design: The research adopted a non-experimental cross-sectional descriptive study design. The study used quantitative methods, and the sampling size was 300 respondents. The inclusion criteria were registered nurses who were practising in wards that encounter pressure ulcers in their daily nursing practise. The exclusion criteria were registered nurses who were not practising, and those who were on leave and who were working in wards that are less likely to encounter pressure ulcers. A structured self-reporting questionnaire was used to collect data.

Data analysis: Data were run on SPSS Version 25. Descriptive statistics, such as frequencies and percentages were used. Hierarchical linear modelling was used to determine if biographical variables affect knowledge, attitude and barriers. Cronbach's alpha was used to measure reliability. The knowledge assessment questions instrument was not deemed to be reliable as the group Cronbach's alpha was only 0.440. The subsections were also not reliable; therefore, the questions were assessed individually. The overall Cronbach's alpha for the attitude scale was 0.624 and was reliable. T-tests and ANOVA were used to compare groups. The principal component exploratory factor analysis was used to classify the barriers' questions. The Kaiser Meyer Olkin (KMO) of sampling adequacy was 0.707. The effect size of 0.5 equates with a medium effect size and is statistically significant. Non-parametric correlations were used to study the strength of a relationship between variables.

Results: The results show that 228 nurses responded to the study. The respondents had very good knowledge on the theme of nutrition, but showed a lack of knowledge of pressure ulcers prevention on the themes of aetiology and development, risk assessment, classification and observations, reduction of the magnitude of pressure and shearing and measures to reduce the duration of pressure or shear. Most of the respondents indicated a negative attitude towards pressure ulcers' prevention. Factor analysis was used to classify barriers towards pressure ulcers' prevention as knowledge barriers, psychological draining barriers and resource barriers.

ABBREVIATIONS AND ACRONYMS

AHCPR	Agency for Health Care Policy and Research
AHRQ	Agency for Healthcare Research and Quality
ANOVA	Analysis of Variance
APRM	Alternating Pressure Redistribution Mattress
APuP	Attitude Pressure ulcer Prevention
CI	Confidence Interval
CLP	Constant Low Pressure
CMS	Centres for Medicare and Medicaid Services
CVI	Content Validity Index
EPUAP	European Pressure Ulcer Advisory Panel
FMW	Female Medical Ward
FOW	Female Orthopaedic Ward
FSW	Female Surgical Ward
g/L	grams per litre
HAPUs	Hospital Acquired Pressure Ulcers
HREC	Human Research Ethics Committee
ICC	Intraclass Correlation Coefficient
ICU	Intensive Care Unit
KMO	Kaiser Meyer Olkin
MDH	Mahalapye District Hospital
MMW	Male Medical Ward
MOW	Male Orthopaedic Ward

MmHg	Millimetre of mercury
MSW	Male Surgical Ward
NPUAP	National Pressure Ulcer Advisory Panel
NRH	Nyangabgwe Referral Hospital
NuMIQ	Research to promote Quality in Nursing and Midwifery
NWU	North-West University
OT	Operating Theatre
PCA	Principal Component Analysis
PMH	Princess Marina Hospital
PT	Patient
PTs	Patients
PU	Pressure ulcer
PUs	Pressure Ulcers
PUP	Pressure Ulcer Prevention
PUKT	Pressure Ulcer Knowledge Test
RN	Registered Nurse
SCDNT	Self-Care Deficient Nursing Theory
SPSS	Statistical Package for the Social Sciences
UMTH	University Teaching Hospital Maiduguri
WC	Wound Care Unit
WHO	World Health Organization

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CHAPTER 1: BACKGROUND AND PROBLEM STATEMENT

1.1 Introduction

This study is based on an assessment of nurses' knowledge, attitude and barriers towards pressure ulcers' prevention (PUP). The findings of the study revealed that it is imperative for the hospitals in Botswana to revisit their policies and processes on the prevention of pressure ulcers. This chapter provides an overview of the background to the study, followed by a problem statement. The chapter further presents the research questions, research aim and objectives and the paradigmatic perspective. These will be followed by the research methodology; outlines of the ethical considerations followed in the study and, finally, present an outline of the chapters of the dissertation and conclusion.

1.2 Background

Pressure ulcers (PUs) are outlined as a localised injury to the skin and underlying tissue typically over a bony prominence as a consequence of pressure or pressure in combination with shear or friction (Black *et al.*, 2007:148; Moore & Cowman, 2014:2; Dealey *et al.*, 2015:309). A pressure ulcer is an injury that breaks down the skin and underlying tissue when an area of skin is placed under continuous pressure for a long period of time, triggering tissue ischemia, termination of nutrition and oxygen supply to the tissues and, ultimately, tissue necrosis due to external forces (Bharracharya & Mishra, 2015:4; Cooper, 2013:60). Stansby *et al.* (2014:2592) outlined that pressure ulcers are formed when an area of skin and the tissues underneath it are damaged as a result of being positioned under sufficient pressure to impair blood supply.

The skin is the largest organ of the body and provides a protective barrier against bacteria and physical activity while maintaining homeostasis in the internal environment. Injury of either the epidermis or the dermis can lead to systemic infection, increased morbidity, increased cost of care and negative psychosocial implications associated with scarring. Physiological changes in the skin concerning the vascular supply are the most critical factor for attaining and maintaining skin integrity. When the vascular supply is compromised, pressure ulcers may develop (Schindler *et al.*, 2011:27; Pasek *et al.*, 2008:125). Nursing care plays an essential role in the prevention of pressure ulcers.

The typical spots for pressure ulcers are over a bony prominence, such as on the buttocks (sacrum/ischium), heels, hips (trochanter), elbows, ankles (lateral and medial malleolus), back, shoulders, back of the head (occiput) and ears (Butcher & Thompson, 2009:81; Coloplast, 2012:6; Cooper, 2013:60).

Studies were done in high-income countries regarding pressure ulcers. According to Jankowski and Nadzam (2011:253), the overall number of hospitalisations with a secondary diagnosis of pressure ulcers in the United States increased by 80% between 1993 and 2006. Baldelli and Paciella (2008:136) propound that approximately 1.3 million to 3 million adults have pressure ulcers in the United States.

1.3 Problem statement

The prevention of pressure ulcers is rarely researched in low-income countries. Limited research had been done on pressure ulcers in Botswana. According to Löfvenmark *et al.* (2017:1), a study was conducted on patients' post-traumatic spinal cord injury in Princess Marina hospital in Botswana from 1 February 2011 to 31 January 2013. This study report indicated that pressure ulcer prevalence ranges from 35 to 57% in patients' post-traumatic spinal cord injury.

Elsewhere in Southern Africa, Giaquinto-Cilliers and Kotzé (2014:45) propound that the incidence and prevalence of pressure ulcers are estimated to be 4.5% at Groote Schuur hospital in the Western Cape. In Sweden, a national study of pressure ulcers' prevalence indicated a prevalence of 16.6% in hospitals and 14.5% in nursing homes (Gunningberg *et al.*, 2015:2; Gage, 2015:53). Various studies indicate that in the United States' hospitals, approximately 60,000 patients die each year from complications due to hospital-acquired pressure ulcers (Perry *et al.*, 2012:5; Kruger *et al.*, 2013:572; Dilie & Mengistu 2015:2). In Botswana, there is a gap that exists in the evidence found about the problem only one study was done on patients with traumatic spinal cord injury, and it cannot be compared to the prevalence found in other studies.

The dearth of knowledge, inadequate skills and a negative attitude among nurses about pressure ulcers prevention, contributes significantly to the occurrence of deterioration of pressure ulcers (Kaddourah *et al.*, 2016:1). Various authors in developed countries indicate that prevention of pressure ulcers is a multidisciplinary accountability in which nurses perform a critical role (Nuru *et al.*, 2015:4; Fu Shaw *et al.*, 2014:1; Baldelli & Paciella, 2008:136; Ilesanmi *et al.*, 2012:24). Prevention of pressure ulcers is an indispensable fragment of nursing care. Thus, preventing pressure ulcers ought to be the goal of all nurses (Nuru *et al.*, 2015:4; Fu Shaw *et al.*, 2014:1). Therefore, this study is specific to nurses' knowledge, attitude and barriers towards pressure ulcers prevention in two referral hospitals in Botswana. The findings of this study will be used by the nursing management to develop initiatives to improve attitudes and address barriers towards the prevention of pressure ulcers.

Premised on the background of inadequate studies and evidence, this study set out to describe the level of nurses' knowledge, attitude and barriers towards prevention of pressure ulcers and thereby generated new knowledge that can be used by programme managers and stakeholders in the prevention and interventions of pressure ulcers. Although it is also crucial to know the competence of the nurses, the focus was on knowledge, attitude and barriers in this study.

Based on the above gap identified, the researcher had the following questions;

- What is the knowledge of nurses in the selected referral hospitals of Botswana towards pressure ulcers' prevention?
- What is the attitude of nurses in the selected referral hospitals of Botswana towards pressure ulcers' prevention?
- What are the barriers that nurses in the selected referral hospitals of Botswana experience in pressure ulcers' prevention?

1.4 Research aim and objectives

The research aim is the purpose, goal or desired outcome of the study (Botma *et al.*, 2010:185). The research objective is a clear, concise and a declaration statement in the present tense. It focuses on variables identified, analysed or described (Brink *et al.*, 2012:85).

1.4.1 Research aim

The aim of this research is to improve pressure ulcers' prevention in the selected referral hospitals in Botswana.

1.4.2 Research objectives

The following objectives were set:

- To describe the knowledge of nurses in the selected referral hospitals of Botswana towards pressure ulcers' prevention.
- To describe the attitude of nurses in the selected referral hospitals of Botswana towards pressure ulcers' prevention.
- To describe the barriers that nurses in the selected referral hospitals of Botswana experience towards pressure ulcers' prevention.

1.5 Paradigmatic perspective

According to Jarošová (2014:12), a paradigm is a fundamental belief system or worldview that directs the researcher, not only in selections of the method but also in ontologically and epistemologically fundamental approaches. The ontology of this study is the researcher's assumption about the nature of reality (Brink *et al.*, 2012:25). In this study, the researcher assumed that reality is based on the scientific method. Therefore, the researcher was detached (an observer) on the empirical analytic inquiry. A survey was used to collect data as an apparent indicator of reality.

The epistemology of this study is the researcher's belief about the knowledge of reality (Brink *et al.*, 2012:25). The participants who were investigated are human beings who have their own thoughts, interpretations and meanings. The methodological perspective refers to the research methods, strategy, plan of action, process, or design the researcher used to obtain knowledge about the reality (Brink *et al.*, 2012:25; Crotty, 2003:3). The researcher explicitly selected a mode of inquiry to fit the nature of the problematic situation of the study.

Brink *et al.* (2012:25) define paradigms as a way of viewing at natural phenomena that incorporate a set of philosophical assumptions that direct one's approach to investigation. The paradigm in this study assisted the researcher to choose an approach to address the research problem. It further served to define what the researcher wanted to study, the research questions and how to ask them, and the rules the researcher followed in interpreting data (Botma *et al.*, 2010:39). These assumptions are divided into meta-theoretical, theoretical and methodological assumptions.

1.5.1 Meta-theoretic assumptions

The meta-theoretic assumptions refer to assumptions of the researcher about a person, environment, health and the discipline, for example, nursing practise (Botma *et al.*, 2010:187). In this study, the researcher viewed a person as a holistic being with mind, body and spirit, who is the recipient of nursing actions.

An environment in this study is viewed as a safe place for physical, mental and social wellbeing that can have an impact on the health and wellbeing of those in the area. It is the recipient's specific surroundings.

In this study, the researcher viewed nursing actions as a holistic approach to a person's (recipient's) health or wellbeing. In such a holistic approach health is seen as a "state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (WHO, 1995:1).

1.5.2 Theoretic assumptions

According to Botma *et al.* (2010:187), theoretical assumptions indicates the researcher's existing knowledge of theoretical or conceptual frameworks, which include models, theories, concepts and definitions. According to Orem *et al.* (2004:7), nursing theory is the term specified to the body of knowledge that is used to support nursing practice. The concept and theory of nursing is a helping service relating to the nature and extent of patient self-care deficit or limitations (Orem *et al.*, 2004:9). In this study, Orem's model provided a perspective of the person for whom a nurse is caring. It helps the nurse to specify the focus for the delivery of care in the prevention of pressure ulcers. The researcher viewed Orem's model as a guide to the knowledge and skills required to prevent pressure ulcers.

Orem's Conceptual Model outlines three interrelated theories within the Self-Care Deficient Nursing Theory (SCDNT). The self-care theory helps to maintain structural integrity and human functioning as well as contributing to human development. The second theory, the theory of self-care deficit, introduces the need for nursing in caring, innovative, advocating and teaching patients on prevention of diseases to promote health. The second theory of Orem relevant to this study shows the need for nursing action in the prevention of pressure ulcers. To prevent pressure ulcers, the nurse should direct nursing actions to the dependent patient who has a self-care deficit. The third theory is the health promotion whereby nurses provide health education to patients. The third theory's relevance is that the nurses' teaches patient how to maintain skin integrity to prevent development of pressure ulcers.

In this study, the researcher understood the self-care deficient nursing theory as a link that provided a positive frame of reference about nurses and patients in the prevention of pressure ulcers, and the interactions between them. Orem's model of self-care specified in this study indicated that nursing actions are taken concerning a patient's needs for pressure ulcers' prevention. Compensation of care thereby enables the nurse to formulate a care plan as per the patient's needs in pressure ulcers' prevention. In this study, Orem's model of self-care theory introduces nurses to the ability to assess patients for individual self-care deficits and plan a suitable set of interventions to help them overcome and restore their self-care deficits to maintain the patients' skin integrity.

Theoretical assumptions further embrace ideas, descriptions, associations, and assumptions or propositions resulting from nursing models or other disciplines and project a purposive, methodical opinion of phenomena by designing explicit inter-relationships among concepts for the purposes of describing, clarifying, forecasting, and/or prescribing (Lee, 2013:58; Alligood, 2013:43).

Conceptual definitions of key variables promote understanding of these concepts, thereby providing information about the nurses' knowledge, attitude and barriers towards pressure ulcers prevention. The following definitions are outlined:

- **Pressure ulcers** are areas of localised tissue damage caused by the compression of soft tissue over a bony prominence and an external surface for a prolonged period (Black *et al.*, 2007:148; Moore & Cowman, 2014:2; Dealey *et al.*, 2015:309).
- **Prevention of pressure ulcers** means taking actions or a set of actions designed to stop pressure ulcers before it occurs by the use of measures like risk assessment, skincare, maintenance of healthy skin, repositioning of patients, proper and adequate nutrition and management of mechanical loads (Duncan, 2007:606; Bluestein & Javaheri, 2008:1186; Jankowski & Nadzam, 2011:254; Guy *et al.*, 2013:6; Baldelli & Paciella, 2008:138).
- **Referral hospital** in the health care system of Botswana refers to a national hospital at the apex of the health services pyramid that mainly provides specialised services (Seloilwe & Thupayagale-Tshweneagae, 2007:174).
- **Registered Nurses** in this study refers to nurses who had obtained a diploma or a degree in nursing science and are registered by the Nursing and Midwifery Council of Botswana (Potter & Perry 2009:166).
- **Nurses' knowledge of pressure ulcer prevention** refers to the level of nurses' recalling, understanding and relating to the prevention of pressure ulcers in the areas related to pressure ulcer occurrence, risk assessment, skincare and nutrition to maintain healthy skin, management of mechanical loads, and educational programmes for patients, family and staff (Perry *et al.*, 2012:9; Saleh *et al.*, 2012:2197).
- **Nurses' attitude towards pressure ulcer prevention** refers to the importance they regard risk assessment, preserving healthy skin, management of mechanical loads, and education for patient and family (Duncan, 2007:606; Bluestein & Javaheri, 2008:1186; Jankowski & Nadzam, 2011:254; Guy *et al.*, 2013:6; Baldelli & Paciella, 2008:138).
- **Barriers towards pressure ulcers prevention** refer to the perceived challenges that limit the level of nurses' initiation manipulation, and precision of pressure ulcer prevention strategies (Duncan, 2007:606; Bluestein & Javaheri, 2008:1186; Jankowski & Nadzam, 2011:254; Guy *et al.*, 2013:6; Baldelli & Paciella, 2008:138).

1.5.3 Methodological assumptions

In this study, methodological assumptions consist of the beliefs of the researcher regarding methods used in the process of quantitative research (Brink *et al.*, 2012:68). The procedure used by the researcher is deductive and concerned with formulating a hypothesis based on existing theory and then designing a research strategy to test the hypothesis ((Brink *et al.*, 2012:6, Botma *et al.*, 2012:195).

1.6 Study design

The researcher adopted a non-experimental cross-sectional descriptive study design to gather information from a representative sample of a specific nursing population through the use of a questionnaire. This questionnaire aimed to obtain the nurses' knowledge, attitude and barriers experienced towards pressure ulcers prevention in the selected referral hospitals of Botswana. The research adopted a non-experimental cross-sectional descriptive study design to gather information from a representative sample of a specific nursing population with a questionnaire. This questionnaire aimed to obtain the nurses' knowledge, attitude and barriers experienced towards pressure ulcers' prevention in the selected referral hospitals of Botswana. Refer to section 3.2 for the study design.

1.7 Research methodology

Research methodology is concerned with rules and procedures that stipulate how the investigator must study and investigate what must be known. They guide the researcher to acquire appropriate knowledge (Botma *et al.*, 2010:41). The research methodology is discussed in detail in section 3.3.

1.8 Ethical considerations

Research is regarded as a scientific human endeavour that is planned according to a range of procedures, methods, guidelines and legislation (Gerrish & Lacey, 2010:212). Therefore, the researcher in this study was conscious throughout the process to protect the rights of all respondents in the research. An account of these considerations are discussed under the headings; permission and informed consent, anonymity and confidentiality.

1.8.1 Permission and informed consent

Ethical considerations were considered throughout the research process. Prior to conducting the research, the researcher obtained written permission from the Health Research Ethics Committee (HREC) of the North-West University (Ethics number: NWU-00017-18-S1), the

Ministry of Health, Botswana (REFERENCE: HPDME 13/18/1), and selected hospitals (PMH REF: PMH 5/79(400-1-2019; NRH REF: NRH 1/2/17) as well as the unit manager from each ward.

The aim of the study and expectations of the researcher were clearly explained to the respondents before they signed the consent form, which allowed them to make an informed decision, whether to participate or not, without compulsion. The respondents were told during the recruitment process that they could withdraw from the study whenever they felt like it and, even when they had signed the consent form. The forms were also signed by a witness who saw respondents signing, and the researcher signed each form.

1.8.2 Anonymity

The researcher was answerable for keeping all private information of respondents anonymous. Anonymity refers to maintaining the secrecy of the respondent's identities (Brink *et al.*, 2012:37). Making data 'anonymous' means "removing the contributor's name" (Brink *et al.*, 2012:37). Precautions were taken to mean to protect anonymity and only promise the level of privacy that was realistically offered (Brink *et al.*, 2012:37). The researcher ensured that the individual respondent's questionnaire, and references to hospitals and wards/units in which they practice were coded during data collection. The reader will not be able to identify the individuals, hospitals or wards from the information provided in the research report.

1.8.3 Confidentiality

Confidentiality refers to the "researcher's responsibility to prevent all data gathered during the study from being connected to individual respondents, revealed or made accessible to any other person" (Brink *et al.*, 2012:38). All information collected from the respondents was kept in a safe place, in a locked filing cabinet at the researcher's home during data collection. Only the researcher was able to unlock and gain access to the content of this filing cabinet. The coding lists were kept separate from the questionnaires to protect the contact information of participating wards. The coding list consisted of hospital codes and ward codes; this verified how many questionnaires were handed out and how many were returned. All electronically stored information was password protected on the researcher's computer. After capturing of data, the researcher submitted the questionnaires and signed informed consent to the supervisor's office at the North-West University, Potchefstroom campus, to be stored.

1.8.4 Justification of research study

The outcome of the study will contribute to nursing profession as it can enhance in-service training and on job training programmes designed for nurses to improve their knowledge and

attitudes, and to find solutions on barriers towards pressure ulcers prevention. The findings of this study will be used in recommendations made to nursing management to take responsibility in providing a plan for staff development in order to improve the quality of pressure ulcer care and prevention. The results of this study provide a unique description of nursing practises, which can enhance nurses' knowledge, attitudes, and how to overcome barriers towards pressure ulcers prevention, and therefore can improve patient care. It can contribute to future nursing research in Botswana and as a result, contributes to the body of knowledge on the subject.

1.8.5 Respect for research participants

The researcher perceived respondents as autonomous individuals who are self-determined. The respondents were given 24 hours to decide whether they wanted to participate in the research without compulsion. The respondents were free to withdraw from the study at any time or change their minds, and it would not count against them in any way. None of the respondents withdrew from this study.

1.8.6 Benefit-risk ratio analysis

This principle ensures that the researcher protects the respondents from harm or discomfort (Brink *et al.*, 2012:35). The aim of the study was to describe the nurses' knowledge, attitude and barriers towards pressure ulcers prevention with the intention to recommend appropriate approaches to prevent pressure ulcers and improve health care. This was accomplished through ensuring a sound study design and methodology which yielded reliable, valid data and outcomes. The benefits of this study outweigh the risks, especially since there were minimal risks involved in this study.

1.8.6.1 Anticipated benefits

The anticipated benefit of this study was to add to the body of knowledge about knowledge, attitude and barriers towards pressure ulcers' prevention, thereby improving health care services and prevent pressure ulcers.

1.8.6.2 Direct benefits

There are no direct benefits for the respondents. The gains of taking part in this study were the opportunity to reflect on practise, which in the end can help the organisation to develop initiatives to prevent pressure ulcers, and ultimately producing quality nursing care to the community.

1.8.6.3 Indirect benefits

The study will contribute to the body of knowledge on the nurses' knowledge, attitude and barriers towards pressure ulcers' prevention in Botswana. Nurses will also benefit from the research outcome through the Ministry of Health and Wellness. The results are expected to improve the prevention of pressure ulcers in the health facilities. The other gains of the study will be for the hospitals' management to gain insight on how to focus in-service training to empower nurses to improve quality of nursing care and reduce hospital stays as well as reduce costs.

1.8.6.4 Anticipated risks and precautions

Brink *et al.* (2012:35) highlight the principles of research as respect for persons (institutions), beneficence (do good), non-maleficence (do no harm), justice, informed consent, confidentiality and anonymity. The researcher ensured that risks were minimal, and precautions were taken to prevent any avoidable risks to the respondents. A risk anticipated by the researcher was the physical discomfort of the respondents during data collection. The researcher ensured a conducive environment which was safe and secure. Another possible risk was lack of privacy, but privacy was maintained as the names were not used on the data collection tool as codes were used. There was a possible risk of wasted time of the respondents, but it was managed effectively. The benefits of the study outweighed the risks.

1.8.7 Reimbursement of study participants

Respondents were not paid to participate in the study. The researcher met the respondents at their workplaces. There were no travel expenses for the respondents. There were also no other costs involved for the respondents to take part in this study.

1.8.8 Data management

All the raw data collected, resources and reports mentioned will be kept for five years within the current data management framework as recommended by the NWU. All the hardcopy raw data, like the consent forms and questionnaires, were locked in the cupboard at the researcher's room during data collection. After capturing of data, the raw data was taken to the supervisor's office by the researcher to be locked away in the supervisor's office at North-West University, Potchefstroom campus. The raw data will be destroyed in five years. All electronic data documents will be password protected, and the computer that will be used to store the information is also password protected. The electronic data will adhere to the same set of standards for storage. All electronic data will be transferred to a password protected electronic compact disk after the completion of the study that will be deleted in five years.

1.8.9 Dissemination of research results

Once the study is completed, the findings will be disseminated to the respondents as a presentation to the two selected referral hospitals. Registered nurses in the catchment areas, who did not participate in the research, will also be invited. To the Ministry of Health and Wellness, dissemination will be done in the form of a report, and the findings will also be communicated to the broader research community and research users as presentations in conferences and publications in accredited health journals.

1.8.10 Role of the members in the research team

The student, as the researcher, recruited the respondents, issued consent forms and questionnaires to the respondents to ensure tight control. The student also captured the data into an electronic spreadsheet, before it was sent for analysis to a statistical consultant. The researcher also double-checked some steps, for example, completion of questionnaires and the transcription of data to the spreadsheet. The researcher was transparent through the entire process by explaining all the expectations before the study commenced and was available to answer all questions objectively and within the ethical and scientific boundaries as agreed upon in the proposal. The study supervisor was the principal investigator. The study supervisor did quality control by checking each step of the research process. The supervisor also reviewed the work which was done by the researcher and provided constructive comments. Data integrity was ensured with the help of a statistician, who also monitored the data analysis process.

1.8.11 Conflict of interest

The researcher declared no conflict of interest. The researcher was not working in either of the relevant hospitals. The researcher was not sponsored by any of the two hospitals to conduct the research.

1.9 Rigour

Rigour in this study refers to the strategies the researcher used to enhance the quality of the study. This was achieved through the choice of sound methodology and taking ethical considerations into account. The validity and reliability of data collection were ensured through the guidance of the statistician and monitoring by the supervisors who are experts in the field of research. The face validity of the instruments utilised for data collection was ascertained by the statistician at the North-West University statistical consultation services and the study supervisors.

1.10 Structure of the dissertation

Chapter 1: Background and problem statement

Chapter 2: Literature review on pressure ulcers' prevention

Chapter 3: Research methodology

Chapter 4: Data analysis and results

Chapter 5: Discussion

Chapter 6: Study recommendations and conclusion

1.11 Conclusion

This chapter aimed to highlight the background of pressure ulcers, to describe the problem that motivated the research process and to set the objectives of the study. Globally, pressure ulcers are a common problem in hospitals, but there is insufficient evidence of nurse's knowledge and attitude towards their prevention in Botswana. The gap in the literature identified the need for research in Botswana regarding nurses' knowledge, attitude and barriers towards pressure ulcers' prevention. In chapter two, an in-depth literature review on what is known about pressure ulcer prevention is presented.

CHAPTER 2: LITERATURE STUDY ON PRESSURE ULCERS AND THEIR PREVENTION

2.1 Introduction

In this chapter, the researcher presents a literature review on pressure ulcers. “Preventing pressure ulcers is one of the key duties of the nursing staff. It is crucial that nurses use evidence-based knowledge and skills in clinical practice for the prevention of pressure ulcers” (Gunningberg *et al.*, 2015:5). Pressure ulcers are a global indicator of the quality of care, and evidence-based clinical guidelines are available in the developed countries to guide care (Gunningberg *et al.*, 2015:2). This chapter jointly with the preceding chapter, will provide the framework for this thesis.

2.2 What is a pressure ulcer?

Pressure ulcers (PUs) are a class of injury that breaks down the skin and underlying tissue when an area of skin is positioned under continuous pressure for some period triggering tissue ischaemia, cessation of nutrition and oxygen supply to the tissues and ultimately tissue necrosis. Pressure ulcers can be described as a constant pressure resulting in distortion or deformation damage to the tissue. There is localised, acute ischaemic damage to the tissue caused by the application of external forces: either shear, friction or a combination of the two (Bhattacharya & Mishra, 2015:4; Walton-Geer, 2009:539). According to Bhattacharya and Mishra (2015:4), pressure ulcers are also known as pressure sores, bedsores or decubitus ulcers. However, ‘bedsores’ is now rarely used since it was recognised that the ulcers are not caused by lying or being in bed. They also stated that pressure ulcers could develop within 2 to 6 hours (Dilie & Mengistu, 2015:1; Bhattacharya & Mishra, 2015:5).

2.3 Pathophysiology of pressure ulcers

The literature indicates that tissues can sustain capillary filling pressure on the arterial side of 30-32 mmHg for only a short duration of time. When pressure increases even slightly above this capillary filling pressure, it causes microcirculatory occlusion, causing tissue ischaemia, tissue death and ulceration and as a result, pressure ulcers formation (Walton-Geer, 2009:539). Additionally, the pressure constricts small vessels and inhibits the supply of oxygen and nutrients at the capillary line, as well as the venous return of metabolic wastes. Metabolic wastes accumulate and cause local vasodilatation, which contribute to oedema, thus, further compressing small vessels and increase oedema and ischemia. Local tissue death occurs, resulting in a pressure ulcer (Cooper, 2013:60; Butcher & Thompson, 2009:86).

2.4 Common sites for pressure ulcers

The common sites for pressure ulcers are over a bony prominence, such as on the buttock (sacrum/ischium), heels, hips (trochanter), elbows, ankles (lateral and medial malleolus), back, shoulders, back of the head (occiput) and ears (Butcher & Thompson, 2009:81; Coloplast, 2012:6; Cooper, 2013:60). The European prevalence study of 2002 by Beeckman indicated that pressure ulcers most frequently develop on bony prominences such as the “coccyx (28.6%), heels (26.0%) and ischium (10.0%)” (Beeckman *et al.*, 2010b:400).

According to Bhattacharya and Mishra (2015:6), the sacrum and ischial tuberosity have a relatively thick covering of soft tissue and a wide supporting surface. However, they further propound that the fat that works as a natural cushion is less in these areas. Therefore, blood vessels of these areas are not ideal for weight-bearing, and even with light compression pressure, ischaemia can develop rapidly.

Cooper (2013:58) propounds that in areas such as “the heels, scalp, malleolus, or ears, there is a lack of subcutaneous fat layers that makes the progression of pressure ulcers a concern”. The heel bone is shielded with a small subcutaneous tissue volume, which creates the pressure to be transmitted directly on the bone (Cooper, 2013:62; Heyneman *et al.*, 2009:115). Patients’ heels are mainly prone to both pressure and shear. Heels are prone to pressure ulcers when they come in contact with the bed surface since the surface of the heel is too small to spread the pressure through devices that are used to prevent pressure ulcers such as mattresses. When inappropriate techniques are used to lift the patient in a bed, heels are prone to the effects of shear forces during movement that causes pressure ulcers (Heyneman *et al.*, 2009:115).

2.5 Risk factors for pressure ulcers

Being of advanced age with a disability are considered common factors that can contribute to pressure ulcers and 70% of elderly patients often encounter pressure ulcers as an outcome of coexistent diseases, immobility and poor nutrition (Coloplast, 2012:8; Díez-Manglano *et al.*, 2016:462; Uba *et al.*, 2015:54; Cooper, 2013:60). Pressure ulcers are a perilous problem for bed-ridden patients and those who use wheelchairs. Similarly, neurologically impaired patients, chronically hospitalised and chronic diseases including diabetes, vascular disease, and nervous system disabilities affecting mobility can also indirectly speed up the pressure ulcer development (Ostadabbas *et al.*, 2012:1265; Kruger *et al.*, 2013:572).

Likewise, people with spinal cord injury have a high risk of pressure ulcers due to impaired skin sensation, reduced mobility and incontinence. Additionally, Intensive Care Unit patients are at

high risk of developing pressure ulcers and increased mortality due to co-morbidity, the complex nature of their underlying conditions, mechanical ventilation, use of sedatives and an inability to report discomfort (Hitzig *et al.*, 2013:600; Strand & Lindgren, 2010:336; Gage, 2015:53; Cooper, 2013:60).

The most significant risk factors related to intraoperative patients are the amount of time a patient spends on the operating bed. The surgical procedures lasting longer than 2.5 to 3 hours are significantly more likely to cause skin and underlying tissue damage. The substantial risk factors that are specific to intraoperative patients are the length of surgery, positioning, positioning devices, warming devices, anaesthetic agents, sedation, vasoactive medications, instrumentation, for example, retractors, type of surgery, and intraoperative haemo-dynamics, for example, patients maintaining a diastolic pressure below 60 mmHg (Primiano *et al.*, 2011:3).

2.6 Aetiology of pressure ulcers

The aetiology of pressure ulcers is associated with intrinsic and extrinsic factors (Anders *et al.*, 2010:375; Butcher & Thompson, 2009:81; Dillie & Mengistu, 2015:1).

2.6.1 Extrinsic factors

These are physical mechanism factors, events or circumstances that are external to the patient who develops pressure ulcers, such as; pressure, shear and friction (Anders *et al.*, 2010:375; Butcher & Thompson, 2009:81; Dillie & Mengistu 2015:1).

2.6.1.1 Pressure

Pressure is described as the load applied at right angles to the tissue interface. Normal capillary pressure at the arterial side is around 32mmHg. Any pressure higher than 32mmHg may restrict blood flow, causing tissue damage. Relative low pressures over bony prominences for a prolonged period also has a detrimental effect on tissues. The unevenly distributed pressure applied between the pressure points, causes constriction of the blood vessels which leads to cellular anoxia, the build-up of metabolic waste and eventual cell death (Cooper, 2013:60; Butcher & Thompson, 2009:81; Islam, 2010:18).

2.6.1.2 Shear

Shear is a mechanical pressure applied parallel to the skin surface, which affects blood supply that leads to ischemia, cellular death and necrosis. The interaction of friction and pressure causes shear forces. Shearing occludes blood flow and is significant in causing pressure ulcers. It may remove epidermal layers and make the skin more vulnerable to injury and pressure

effects. The areas of the body parts, which are susceptible to shearing, include the ischial tuberosity, heels, shoulder blades and elbows. These are areas on which the body is often supported when in a sitting, or lying semi-recumbent positions, which allows forward slide. Shear is most significant when a caregiver remove a patient along with the surface of the sheet during repositioning or allows the patient to slide down from the high Fowler's position. The shearing forces cause triangular-shaped sacral ulcers with tunnelling or a deep sinus track (Bhattacharya & Mishra, 2015:6; Cooper, 2013:60; Butcher & Thompson, 2009:84; Islam, 2010:18).

2.6.1.3 Friction

Friction-induced tissue damage refers to kinetic friction. It occurs when two surfaces are moving across each other and rub against each other. The bed linen may rub against the support surface when a patient is dragged during position changing, causing friction force. If the head of the bed is high, gravity pulls the body downward, and friction and shearing forces cause necrosis in the sacral area. It can cause excessive wear to the epidermal layers, resulting in exposure of the underlying structures, and formation of blisters leading to exposure of the dermis (Cooper, 2013:60; Butcher & Thompson, 2009:84; Islam, 2010:18).

2.6.1.4 Moisture

Moisture contributes to maceration (softening and breaking down of the skin), which may make the epidermal layer more vulnerable to breakdown from pressure. Enzymes in faecal material can erode epidermal layers. Enzymes in and the pH of faecal matter may act in conjunction with moisture to promote skin maceration and epidermal erosion. De-epithelialisation leads to transdermal water loss that creates maceration, and adherence to the skin, to clothing, and any other supports in contact, resulting in further injury (Bhattacharya & Mishra, 2015:7; Cooper, 2013:60).

2.6.2 Intrinsic factors

Intrinsic factors are patient-specific factors that are unique to the individual, such as age, nutrition, and general health status, innate level of activity and mobility and morbidities such as diabetes (Anders *et al.*, 2010:375; Butcher & Thompson, 2009:81; Dilie & Mengistu, 2015:1).

2.6.2.1 Advanced age

Elderly persons have less subcutaneous fat, decreased dermal thickness, and decreased sensory perception. These factors make elderly patients prone to more rapid tissue injury, and less likely to respond to tissue cues to change position. Older people experience low blood

supply to the skin, they have a decrease epithelial layer, decreased subcutaneous fat, collagen fibre and loss of elasticity, and as a result, lowered tolerance to hypoxemia (low level of oxygen) which can cause pressure ulcers (Cooper, 2013:60; Walton-Geer, 2009:544; Islam, 2010:20).

2.6.2.2 Nutrition

Poor nutritional status causes a decrease in protein and renders tissue more susceptible to the effects of pressure. Nutritional conditions such as malnutrition, hypoproteinaemia and anaemia can cause significant delays in wound healing, affect tissue perfusion, and speed up the formation of pressure ulcers. Patients who are malnourished have bony prominences and are therefore at greater risk for pressure ulcers. A low albumin level is an indicator of malnutrition (normal levels, 36-52 g/L). Low albumin serum leads to interstitial oedema, which breaks down when exposed to shear, friction and pressure (Bhattacharya & Mishra, 2015:7; Cooper, 2013:60).

2.6.2.3 Innate level of activity and mobility

Immobility promotes unrelieved pressure on affected bony prominences. Critical illness is associated with pressure ulcer development, especially in Intensive Care Units, because of the inability of the patient to change position and increased shear forces when sliding down in bed while on bed rest. Moreover, paralysis and insensibility may produce atrophy of the skin leading to skin thinning. This makes the skin more susceptible to the friction and shear forces, which the patient experiences when being moved. Likewise, contractures and spasticity can contribute by repeatedly exposing tissues to pressure through the flexion of a joint. In case of loss of sensation, the pain signal that would typically cause an immobile individual to change position is lost (Bhattacharya & Mishra, 2015:7; Cooper, 2013:61).

2.6.2.4 Morbidities

Patients with conditions like diabetes mellitus, spinal cord injury, cerebrovascular disease and peripheral vascular disease have impaired sensory perceptions. Therefore, these groups of patients are at risk of development of pressure ulcers because these conditions influence blood supply and capillary perfusion leading to tissue damage. Consequently, decreased blood pressure indicates the decreased perfusion to tissues. As a result, impaired blood circulation is associated with the development of pressure ulcers when the systolic pressure is less than 100mmHg, and the diastolic is less than 60mmHg. Furthermore, the vasoactive medications to improve blood pressure increase vasoconstriction which may result in further decreased perfusion of distal tissues such as skin (Islam, 2010:20; Bhattacharya & Mishra, 2015:7; Cooper, 2013:61).

2.7 Stages of pressure ulcers

There are various stages of pressure ulcers ranging from stage 1 to 4 as established by the National Pressure Ulcer Advisory Panel (NPUAP) of the United States of America (Primiano *et al.*, 2011:5).

- Stage 1

A stage 1 pressure ulcer is the most superficial type of ulcer. It entails non-blanchable erythema of intact skin which appears red over a bony prominence. The affected area of skin appears discoloured and is red in white people, and purple or blue in people with darker coloured skin. The ulcer may hurt or itch. It may also feel either warm and spongy or hard (Beeckman *et al.*, 2007:683; Black *et al.*, 2007:269; Bhattacharya & Mishra, 2015:7; Cooper, 2013:58).

- Stage 2

Stage 2 is identified as a partial thickness skin loss involving epidermis, dermis or both. The ulcer is superficial and presents clinically as an abrasion or blister (Beeckman *et al.*, 2007:683; Black *et al.*, 2007:269; Bhattacharya & Mishra, 2015:8; Cooper, 2013:58).

- Stage 3

In stage 3 there is full-thickness skin loss involving damage to or necrosis of subcutaneous tissue that may extend down to, but not through, underlying fascia (Beeckman *et al.*, 2007:683; Black *et al.*, 2007:269; Bhattacharya & Mishra, 2015:8; Cooper, 2013:58).

- Stage 4

A stage 4 pressure ulcer is the most severe type of pressure ulcer. The skin is severely damaged, and the surrounding tissue begins to die (tissue necrosis). With stage 4 pressure ulcers, there is extensive destruction, tissue necrosis and muscle, bone, or supporting structures are visible. In this stage, sinus tracts may be associated with wound progression (Beeckman *et al.*, 2007:683; Black *et al.*, 2007:269; Bhattacharya & Mishra, 2015:8; Cooper, 2013:58).

The National Pressure Ulcer Advisory Panel (NPUAP) of the United States of America has added two additional stages, which are unstageable/unclassified and suspected deep tissue injury (Black *et al.*, 2007:269; Cooper, 2013:58; Anders *et al.*, 2010:373).

- Unstageable/unclassified

The unstageable/unclassified is characterised by full-thickness skin or tissue loss and the depth of the ulcer is completely obscured by slough (yellow, tan, grey, green, or brown) and/or eschar (tan, brown, or black) in the wound bed (Black *et al.*, 2007:269; Cooper, 2013:58).

- Suspected deep tissue injury

The suspected deep tissue injury pressure ulcer is evidenced by a purple or maroon localised area of discoloured, intact skin or blood-filled blister which is hard (Black *et al.*, 2007:269; Cooper, 2013:58).

2.8 Incidences and prevalence of pressure ulcers

The incidence and prevalence of pressure ulcers is a quality indicator of nursing care, widely accepted as a nurse-sensitive outcome indicator, namely an outcome that is sensitive to and can be used to measure the quality of a particular aspect of care delivered by nurses.

Many patients develop pressure ulcers due to intrinsic and extrinsic factors (Gage, 2015:53; Kruger *et al.*, 2013:572). The prevalence of pressure ulcers in Europe remains unacceptably high, ranging from 9.0% to 18.1% in 2011. The national study of pressure ulcers prevalence in Sweden indicated a prevalence of 16.6% in hospitals and 14.5% in nursing homes (Gunningberg *et al.*, 2015:1; Gage, 2015:53).

The NPUAP signify that 1 to 3 million people in the United States develop pressure ulcers each year. Additionally, information from the Agency for Healthcare Research and Quality (AHRQ) indicates that pressure ulcer-related hospitalisations increased by an alarming rate of 80% from 1993 to 2006 (Dorner *et al.*, 2009:212). Likewise, in United States hospitals, nearly 60,000 patients die each year from complications due to hospital-acquired pressure ulcers (Perry *et al.*, 2012:5; Kruger *et al.*, 2013:572; Dilie & Mengistu 2015:2).

Fewer studies have been carried out in Africa. A study in Felegehiwot Referral Hospital, Bahir Dar, Ethiopia, found that, out of a total of 422 patients, 71 were diagnosed with pressure ulcers giving the prevalence rate of 16.8 % (Nuru *et al.*, 2015:2).

In a study conducted at six universities in South-West Nigeria, the quadriplegic and paraplegic patients had a high prevalence of pressure ulcers at 28.2%. The medical patients had less at 12.8% (Adegoke *et al.*, 2013:128). Furthermore, a prospective study of pressure ulcer prevalence among patients with spinal cord injuries conducted in Gombe, North-Eastern Nigeria in 2004 revealed that 16 out of 24 patients developed pressure ulcers c (Uba *et al.*, 2015:55).

Likewise, a study conducted at the Helen Joseph Hospital in the Gauteng Province of South Africa also indicated that in May 2014, there were 31 incidences of pressure ulcers on admission and 16 acquired incidences. Moreover, in June 2014, there were 34 incidences of pressure ulcers on admission and ten acquired incidences recorded at the same hospital (Shorney, 2014:62). Giaquinto-Cilliers and Kotzé (2014:45) reported that the incidence and prevalence of pressure ulcers are estimated to be at 4.5% at Groote Schuur hospital in the Western Cape, South Africa, and further reported 7.6% of patients developed pressure ulcers as a complication after spinal cord injury in South Africa. There is no specific study done in Botswana that reports about incidences and the prevalence of pressure ulcers in Botswana.

Although statistics of pressure ulcers are known in developed countries and a few African countries, in Botswana, the statistics are limited. According to a continuing professional developing presentation by Coloplast in March 2016 on wound care needs in Princess Marina hospital, Botswana, 28 patients had pressure ulcers; 6 patients in the spinal unit, 11 patients in orthopaedic wards, nine patients in medical wards and two patients in the intensive care unit (Loudon, 2016:12). Likewise, Löfvenmark *et al.* (2017:1) who conducted a prospective follow-up study at the spinal cord injury rehabilitation centre in Princess Marina hospital in Botswana from 1 February 2011 to 31 January 2013, reported pressure ulcer prevalence ranges between 35 to 57% in patients after traumatic spinal cord injury.

2.9 Consequences of pressure ulcers

Pressure ulcers cause distress and discouragement, significantly reduce the quality of life, provide a route for infection, complicate recovery, significantly increase nursing time, lead to economic overload for the healthcare industry, significantly delay discharge from the hospital, and might contribute to mortality (Jiang *et al.*, 2014:2587; Primiano *et al.*, 2011:3; Baldelli & Paciella, 2008:136; Gage, 2015:54). Moreover, in the United States, it was found that pressure ulcers on older patients significantly affected the physical, social, psychological and financial aspects of quality of life (Gage, 2015:54). A vast amount of time and energy is spent on the planning of pressure ulcers' prevention strategies.

Additionally, pain is another implication with unpleasant sensory and emotional discomfort arising from actual or potential tissue damage. Pressure ulcer pain present with a neuropathic element caused by damage or dysfunction in the nervous system and is typically described as sharp, shooting, or burning. Pressure ulcers' pain is described as unpleasant and severe by most patients. Regardless, of pressure ulcer severity, patients are experiencing some form of pain or discomfort in all stages of pressure ulcers (Gorecki *et al.*, 2011:444). Therefore, the pain associated with pressure ulcers is often described as hot, burning across all stages; throbbing in

stage II, tender and stabbing in stage III and throbbing, heavy, and sharp in stage IV (Kim *et al.*, 2016:2; Gorecki *et al.*, 2011:451).

Cost is another severe implication of pressure ulcers. In the United States, the cost of treating for each ulcer ranges from \$500 to \$70 000. The estimated expenditures for treating pressure ulcers is \$1.6 billion to \$11 billion per year (Baldelli & Paciella, 2008:136; Ostadabbas *et al.*, 2012:1265). Therefore, due to high costs of treating pressure ulcers, in 2008 the Centres for Medicare and Medicaid Services (CMS) policy introduced a non-payment of Stages III and IV Hospital Acquired Pressure Ulcers (HAPUs) for all Medicare beneficiaries. Thus, CMS will not pay hospitals on behalf of patients who develop stages III and IV pressure ulcers in the hospital (Lyder, 2011:16).

In South Africa, health care costs associated with pressure ulcers are estimated at R10 000 for one pressure ulcer (Shorney, 2014:67). In Groote Schuur hospital in the Western Cape, South Africa, the expenditure is approximately R250 000 annually for the treatment of pressure ulcers with an estimated annual projection expenditure of R2 million for the Western Cape (Giaquinto-Cilliers & Kotzé, 2014:45).

However, there are no recorded costs associated with pressure ulcers in Botswana, not meaning that there are no costs incurred. Costs lie in daily dressings; sometimes using expensive special dressings like silicone border foam which are water-resistant with nonexpanding foam to maintain a moist wound site for healing and wound debridement. Pressure ulcers prolong the patients' length of stay and increase patients' morbidity and mortality. The above information is supported by a study conducted in Princess Marina hospital, from 1 February 2011 to 31 January 2013. The results showed high mortality rates and prolonged hospital stay with a median of 5 months, mainly due to incidence and treatment of pressure ulcers in 41% of patients after acute traumatic spinal cord injuries (Löfvenmark *et al.*, 2017:1).

Litigation also adds to the burden of healthcare costs, especially for long-term care, where nearly 87% of judgements and out-of-court settlements against facilities are awarded to the plaintiffs. From September 1999 to April 2002, there were 54 nursing home lawsuits involving pressure ulcers in the United States (Dorner *et al.*, 2009:212). A retrospective study in the United States investigating jury awards in pressure ulcer cases found financial awards ranging from \$5,000 to \$82,000,000, with a median award of approximately \$250,000 (Lyder, 2011:17).

In some countries like Botswana, there is no reported litigation for pressure ulcers' care as cases are usually settled out of court. However, nurses should be knowledgeable about the prevention of pressure ulcers to avoid being taken to court for malpractice.

2.10 Prevention of pressure ulcers

Pressure ulcers are a global indicator of the quality of care, and evidence-based clinical guidelines are available in the developed countries to guide their care (Gunningberg *et al.*, 2015:1). Pressure ulcers are preventable with quality care and accountability of nurses (Fu Shaw *et al.*, 2014:6). Observing and preserving skin integrity is a vital constituent of assessing a patient's health status and evaluating the quality of nursing care (Walton-Geer, 2009:538; Chianca *et al.*, 2010:44).

Black *et al.* (2011:25) contend that patients who are admitted to a hospital without pressure ulcers should not develop a pressure ulcer unless clinically unavoidable. A pressure ulcer is only considered unavoidable if the facility records that nurses have: (i) evaluated and treated risk factors, (ii) clear and applied interventions consistent with needs and documented standard of practice, (iii) checked and assessed the impact of the intervention and (iv) revise the intervention as appropriate (Gunningberg *et al.*, 2015:5; Black *et al.*, 2011:30). Prevention measures in individuals at risk should be used continuously during the time that they are at risk (Beeckman *et al.*, 2011:167).

Pressure ulcers are preventable through the dedication of nurses towards the care of patients. Prevention is directed towards addressing the extrinsic and intrinsic factors (Fu Shaw *et al.*, 2014:6). Nurses should reflect all bed-ridden and chair-bound persons or individuals whose aptitude to reposition is reduced, to be at risk for pressure ulcers. Identification of all individual risk factors (decreased mental status, exposure to moisture, incontinence, device-related pressure, friction, shear, immobility, inactivity, nutritional deficits, co-morbidities) is vital to guide nurses' specific preventive measures and to modify care according to the individual factors (Duncan, 2007:606; Bluestein & Javaheri, 2008:1186).

Prevention of pressure ulcers includes various aspects namely; risk assessment, daily skin inspection, relieving pressure, support surfaces, nutritional assessment and quality assurance programmes (Duncan, 2007:606; Bluestein & Javaheri, 2008:1186; Guy *et al.*, 2013:6; Baldelli & Paciella, 2008:138; Cooper, 2013:59).

2.10.1 Risk assessment

Nurses should perform a risk assessment on admission and daily to identify all the patients who may be at particular risk of PU development and adjust prevention strategies according to the patients' changing needs (Duncan, 2007:606; Baldelli & Paciella, 2008:138).

Documentation of risk assessment subscale scores and total scores is crucial to implement a risk-based prevention plan. A daily risk assessment quickly enables nurses to identify if the

patient has a nutritional deficiency and initiate a consult with the clinical dietician (Duncan, 2007:606; Bluestein & Javaheri, 2008:1189; Baldelli & Paciella, 2008:138).

Additionally, incorporating risk assessment in the hospitals' plans by the integration of an integrating risk assessment tool in the admission documentation is vital. This will enable nurses to document findings and initiate preventive strategies as needed. Furthermore, the use of a single standard risk assessment tool in a health facility provides ease of transition of patients between levels of care. Use of stickers on the files of patients who are at risk is crucial as it allows quick identification of patients at risk (Duncan, 2007:606).

A wide range of risk assessment scales used in developed countries exists, which hospitals in Botswana can adopt in order to improve quality nursing care on pressure ulcers' identification and prevention strategies. Currently, no literature could be found on risk assessment scales used in Botswana. The risk assessment scales used in developed countries are discussed below:

- The Norton score

The Norton score is widely used in the United States and recommended by the Agency for Health Care Policy and Research (AHCPR). The Norton score classifies patients using five risk factors. These include; physical condition, mental status, activity, mobility, and continence, with scores ranging from 5 to 20, the lower score indicates higher risk (Cooper, 2013:60; Anders *et al.*, 2010:377; Diez-Manglano *et al.*, 2016:465; Qaseem *et al.*, 2015:361).

- The Braden scale

Another well-known scale is the Braden scale, which is commonly used in the United States and Britain. The focus is on the assessment of six items which are; sensory perception, moisture exposure, physical activity, mobility, nutrition and friction or shear force. Each item is ranked from one (least favourable) to three or four (most favourable) for a maximum total score of 23; the lower score indicates a higher risk. A score of 16 or less indicates a high risk for pressure ulcer development (Cooper, 2013:60; Hoviattalab *et al.*, 2015:1515; Bluestein & Javaheri, 2008:1186; Anders *et al.*, 2010:377; Qaseem *et al.*, 2015:361).

- The Water-low scale

The Water-low scale commonly used in Britain assesses risk by taking into account issues such as sex, age, build, appetite, nurses' visual assessment of skin, condition, mobility, continence, factors contributing to tissue malnutrition, neurologic deficits, major surgery or trauma and medication. The scale ranges from 1 to 64, with higher scores indicative of higher risks (Cooper, 2013:60; Anders *et al.*, 2010:377; Qaseem *et al.*, 2015:361).

- The Jackson Cubbin scale

The Jackson Cubbin risk assessment scale is a tool specific to European critical care units. It is based on assessing the risk of pressure ulcers based on age, weight, skin condition, mental status, mobility, nutrition, respiration, continence, hygiene and haemodynamic status. This scale has a score of 9 to 48 with a lower score indicating a higher risk (Cooper, 2013:60; Qaseem *et al.*, 2015:361).

2.10.2 Daily skin inspection

Daily skin inspection is crucial for pressure ulcers' prevention. Head to toe skin assessment should be performed at least daily on high-risk patients, especially checking pressure points such as the sacrum, ischium, trochanters, heels, elbows, and the back of the head (Duncan, 2007:607). Furthermore, on-going reassessments of skin should be performed at least every eight hours, and the patients' prevention plan should then be adjusted as per the findings of the re-assessment. Nurses must incorporate skin examination into their practise each time they assess the patient.

Likewise, all surgical patients must be considered at risk for pressure ulcer occurrence; therefore, perioperative departments must develop and implement strategic plans for pressure ulcer prevention. The perioperative nurse must perform a detailed skin assessment of each surgical patient. This establishes a preoperative baseline to compare with the patient's postoperative status. The preoperative nurse should check thoroughly for any skin complications like rash, maceration, infection, breakdown, incontinence, lymphedema and look for signs of venous failure, including aching, cramps and pain. Theatre nurses should be familiar with the use of risk assessment scales such as the Braden or Norton scales to validate skin integrity and provide a comparison of preoperative and postoperative skin status (Walton-Geer, 2009:546).

2.10.3 Skincare

According to Guy *et al.* (2013:6), it is imperative for nurses to take extra effort to relieve pressure on the affected area if redness is noted on the skin of the patients. Moreover, the skin should be cleaned at the time of soiling and routine intervals by using a gentle, mild cleansing agent that minimises irritation and dryness of the skin. Hot water and excessive rubbing should be avoided, and lotion should be used after bathing. A moisture barrier should be used every eight hours and upon the occurrence of an episode of incontinence with the use of moisture absorbent pads (Duncan, 2007:606; Baldelli & Paciella, 2008:139).

Diapers must be avoided for patients who are incontinent as diapers irritate the skin and faecal pouches or condom catheters should preferably be used because they keep the skin dry. Nurses should avoid massage over bony prominences because it degrades the cutaneous barrier and therefore promotes skin loss (Duncan, 2007:606; Baldelli & Paciella, 2008:139).

In addition, nurses should provide care that minimises exposure of the skin to moisture due to incontinence, perspiration, or wound drainage, because wet skin is conducive to the development of rashes, is softer, and tends to break down more easily. Hospital protocols should incorporate routine activities such as a “pressure ulcer prevention protocol,” which should include pressure relief, moisture management and nutrition support. Supplies (underpads, disposable barrier wipes, and moisturiser) should be kept by the bedside for easy reach to be able to immediately clean, dry and protect the patient’s skin after each episode of incontinence (Duncan, 2007:607).

2.10.4 Mechanical loading and support surfaces

The European Pressure Ulcer Advisory Panel (EPUAP) and National Pressure Ulcer Advisory Panel (NPUAP) indicated in 2009 that interventions to prevent pressure ulcers should focus on the reduction of the amount and/or duration of pressure and shear. Nursing staff should make every effort to redistribute the pressure on the skin, either by repositioning or by using pressure-relieving surfaces. Repositioning of patients who are bed-bound with a standard mattress must be done at least every two hours to maintaining circulation to areas of the body at risk for pressure ulcers. Additionally, when repositioning the patient, the head of the bed should be kept at the lowest, safe elevation, not more than 30° to prevent shear and pressure on the coccyx (Bluestein & Javaheri 2008:1187; Cooper, 2013:60). The head of the bed of patients who are intubated and receiving enteral feeding should be elevated higher than 30° to limit the risk of ventilator-associated pneumonia and aspiration. The aim of repositioning the patient is to reduce or eliminate pressure, thereby maintaining circulation to areas of the body at risk for pressure ulcers (Cooper, 2013:60).

Repositioning, using the 30° tilted side-lying positions (alternately right side, back, left side) or prone position is advised by the European Pressure Ulcer Advisory Panel (EPUAP) and the National Pressure Ulcer Advisory Panel (NPUAP) (Elliot, 2010:32). It is the nurses’ responsibility to ensure that the appropriate number of staff is present to lift or turn patients.

Nurses should ensure enough pressure redistribution when positioning patients in chairs or wheelchairs (Elliot, 2010:32). Chair-bound patients should not be sitting in the same position for more than one hour (Baldellie & Paciella, 2008:138; Elliot, 2010:32). Furthermore, patients who can shift should be encouraged to change their postures periodically; at least every 15 minutes

and offloading of pressure points by side bending, forward bending, and lifting off the chair with powerful upper body muscles. Poor sitting posture may cause posterior pelvic tilt (sacral sitting) or pelvic obliquity (side tilting onto one buttock) (Perry *et al.*, 2012:20; Elliot, 2010:32). According to Elliot, (2010:32) the ideal chair allows the patient to sit with feet flat on the floor, with hips and knees at 90 degrees and arms or shoulders supported).

The use of pressure-relief devices, incorporating speciality mattress surfaces, padded cervical collars, heel lift devices, and pillows, are recommended in high-risk patients (Cooper, 2013:65; Elliot, 2010:32). Body support surfaces can be categorised into two types; static (stationary) and dynamic. Static body support surfaces are mainly low tech, constant low pressure (CLP) systems. Dynamic devices are generally noisy and more expensive than static devices (Bluestein & Javaheri, 2008:1187).

Static overlays or mattresses provide constant inflation or support and distribute body weight evenly. Static devices include foam, water, gel, and air mattresses or mattress overlays. Static-air overlays allow air to exchange through multiple chambers when a patient lies on it. Air overlays must be re-inflated periodically (Bluestein & Javaheri, 2008:1187).

Moreover, "foam mattresses are categorized into two types such as cold foam mattress (memory-less) and viscoelastic foam mattress (also known as memory foam mattresses)" (Mishu *et al.*, 2014:424; Walton-Geer, 2009:546). Cold foam (similarly known as conventional foam) mattresses are crafted of polyether foam. This is an elastic foam comprising of many tiny closed air cells. After compression, it recovers very rapidly to its original shape (Mishu *et al.*, 2014:424).

A water mattress is a static device that reduces pressure by spreading the weight of the body over a larger area. It moulds to the contours of the body and maintains a constant level of inflation that allows turning of patients every 4 hours (Nwadinigwe *et al.*, 2012:187).

Viscoelastic mattresses are made from polyurethane, are commonly less springy than cold foam and "remember" the figure of a patient's body. These mattresses can adapt to the shape of the human body and can distribute pressure over the entire surface very efficiently. They do not change pressure underneath the body except when an external force or load is applied. The advantages of using viscoelastic foam mattresses are that they actively reduce the pressure by escalating the contact area between the body and the foam, improves blood circulation by increasing the release of pressure, and increases the comfort and stability of the patient. Viscoelastic foam is characterised by its slow recovery after compression (Mishu *et al.*, 2014:424). Gel overlays, also made from viscoelastic polymer, prevent shearing, support weight, and prevent pressure ulcers in the older patient including those with chronic health

comorbidities or vascular disease, and those experiencing extended surgical time that is taking longer than two hours. If punctured, gel overlays are capable of self-repairing (Walton-Geer, 2009:545; Qaseem *et al.*, 2015:360).

Dynamic devices include alternating pressure redistribution mattress (APRM) devices, air-fluidised mattresses and low-air-loss mattresses. The alternating pressure redistribution mattresses (APRM) are externally powered devices that systematically load and off-load pressure by inflating and deflating cells or segments beneath the body while closely matching the intervals to normal spontaneous movement. They are an effective preventive measure because they reduce the duration of pressure and shearing forces by alternating inflation and deflation of air-filled cells (Bluestein & Javaheri 2008:1187; Walton-Geer, 2009:546). APRM produce alternating high and low pressures between the patient and the mattress with diminishing periods of high pressure. That means it is changing the distribution of pressure by inflating or deflating cells within the mattress (Walton-Geer, 2009:546; Qaseem *et al.*, 2015:360).

Air-fluidised mattresses contain small silicone-coated beads. Warm air, under pressure, sets the beads in motion to stimulate circulation and evenly distribute weight. Air fluidised beds without head-of-bed elevation help prevent pressure ulcers in very high-risk patients (Walton-Geer, 2009:546; Cooper, 2013:61).

Low-air-loss mattresses are made of air sacs through which warm air passes to regulate heat and humidity, by flowing air and pressure adjustments. Low-air-loss mattresses are useful in patients with exudate or excessive moisture as the air loss through the mattress surface acts to dry skin surfaces (Cooper, 2013:61; Qaseem *et al.*, 2015:360; Mishu *et al.*, 2014:424; Walton-Geer, 2009:546; Qaseem *et al.*, 2015:360). When using low-air-loss mattresses, the use of traditional linens (bedspread, bedcover, blankets, duvets, throws) is not recommended. The use of bed linens and plastic-lined (non-breathable) pads prevents the drying effects of low-air-loss therapy because airflow is blocked. In addition, the use of bed linens contributes to wrinkles in the sheets, which may contribute to pressure. The underpads should not be plastic-backed because the plastic blocks airflow and retains moisture, which contributes to pressure ulcer development. Although low-air-loss mattresses are used for prevention of pressure ulcers, these mattresses are not recommended in patients receiving mechanical ventilation with an oscillator or patients with unstable spinal fractures (Cooper, 2013:61).

Pressure-reducing surfaces such as special beds, mattresses, sheets and overlays are designed to redistribute pressure, reduce friction, shear, temperature and moisture, and should be used to prevent the development of pressure ulcers. Ideally, all patients who are at risk of

developing pressure ulcers should be placed on pressure-redistributing mattresses and surfaces designed to distribute pressure evenly, and provide chair cushions to patients who use wheelchairs (Duncan, 2007:606; Guy *et al.*, 2013:6; Mallah *et al.*, 2015:107; Cooper, 2013:61; Qaseem *et al.*, 2015:359; Trueman & Whitehead, 2010:49). These pressure-relieving devices are expensive; therefore, nurses should use available resources (such as risk assessment, clinical judgement and proper techniques when turning the patients) and knowledge to prevent pressure ulcers for those with the highest risk.

Other pressure-reducing devices include chair cushions and pillows, foam wedges, and materials that are placed between the knees or used to relieve heel pressure. Ring cushions can cause pressure at the pressure points and therefore not be used, because the pressure is focused locally, thus making the appearance of lesions possible (Bluestein & Javaheri 2008:1188).

The reduction of pressure and shear at the heel zone is a critical clinical practice issue. Although pressure-redistributing mattresses have been proven to be effective in reducing pressure ulcer incidences, the pressure reduction at the heel zone is limited, so it is crucial to use heel supports, boots or a cushion to protect the heel (Heyneman *et al.*, 2009:115).

The patients' heels should be elevated off all surfaces using pillows, placed lengthwise under the calves to the Achilles heel, at each repositioning. When pillows are used, it is crucial to ensure that the heel is not in contact with the mattress to minimise pressure. Heel supports or boots support the heel by protecting heels against shear and distributing pressure evenly. If a heel lift boot device is used, ensure that the device is correctly applied with straps securing the device. Straps should not be in contact with the skin to avoid constriction and pressure, which promote the development of pressure ulcers (Baldellie & Paciella, 2008:138; Duncan, 2007:608; Heyneman *et al.*, 2009:115; Qaseem *et al.*, 2015:360; Cooper, 2013:62).

2.10.5 Support surfaces in theatre

Pressure-redistributing devices are recommended to be used in the operating room for patients assessed to be at high risk of pressure ulcer development. The use of pillows or foam wedges to keep bony prominences, such as knees and ankles, from direct contact with each other to avoid skin friction is recommended. (Baldellie & Paciella, 2008:138; Qaseem *et al.*, 2015:360).

Intraoperatively improper positioning of patients can cause complications with blood pressure, decrease tissue perfusion and venous return, and cause thrombus formation. The patient's skin is at increased risk of tissue damage when the patient's body weight is not distributed evenly on the bed, or if poor tissue perfusion is present. The following factors should be taken into

consideration preoperatively before positioning and giving patients sedation; pre-existing conditions, decreased ranges of motion, previous surgical procedures and presence of joint prostheses. Factors such as fractures and the patient's age, height, and weight must also be considered when positioning a patient preoperatively (Walton-Geer, 2009:540).

When the patient is being operated on the anterior chest for example; open-heart surgery, on the abdomen, pelvis, face, neck, and mouth or extremities, the patient should lie on the back with the face toward the ceiling. The ankles should be uncrossed, arms padded at the sides in a neutral position, or on padded arm boards at less than a 90° angle with palms up, head and upper body in alignment with hips, with the legs parallel. If the patient is pregnant, a wedge should be placed under the patient's right side to shift the uterus to the left to relieve compression on the aorta and vena cava (Walton-Geer, 2009:541). The dynamic-air overlays are usually not used intraoperatively because of the possibility of body movement, electrical problems, and asepsis (Walton-Geer, 2009:546; Cooper, 2013:61).

Lastly, nurses should become familiar with the manufacturer's recommendation for devices used in their units, such as endotracheal securement devices, endotracheal tubes, tracheostomy tubes, or faecal containment devices, heel lift devices and mattresses. They should also ensure that tubing and devices are not placed between skin surfaces and ensure that ventilator tubing are not causing tension on the tracheostomy tube and faceplate because these devices contribute to pressure ulcers by putting pressure on the skin. Cervical collars are associated with the risk for pressure ulcer development at contact points such as the chin, shoulder, and ear (Cooper, 2013:63).

2.10.6 Nutritional assessment

Nutritional assessment is identified as one of the crucial goals of pressure ulcer prevention. Nurses are encouraged to refer patients who are at risk for developing pressure ulcers to nutritional consults. A patient's nutritional and hydration status should be optimised. Nutritional factors such as impaired intake, low body weight or unintentional weight loss, and dehydration may contribute to the development of pressure ulcers. Patients must be provided with enough fluid, protein, and caloric intake. They should further be referred to a clinical dietician to ensure the availability of appropriate snacks, fluids, and supplements (Baldelli & Paciella, 2008:138; Duncan, 2007:607; Bluestein & Javaheri, 2008:1189). According to Black *et al.*, (2011:34) obesity and extreme obese (body mass index (BMI) >40), patients are at risk of pressure ulcers. They further elaborated that the skin of an obese person folds and as a result causes pressure on the skin.

2.10.7 Quality assurance programmes on prevention of pressure ulcers

Unit-based quality assurance projects that identify the effectiveness of preventive measures and the prevalence of pressure ulcers are particularly helpful in preventing pressure ulcers in patients. The members of staff in a unit should identify unit-specific pressure ulcers statistics, track the prevalence of pressure ulcers, and report on them during staff handing over. Unit staff members should reinforce individual accountability for interventions to prevent the development of pressure ulcers and celebrate a decrease in occurrence. Two nurses should do skin assessment on admission and during the hand-over report with a shift change. This can help to reinforce individual accountability in interventions to prevent the development of pressure ulcers (Cooper, 2013:65).

Above all, the level of support and commitment by the leadership and the quality of planning and education are factors that contribute to the successful implementation of prevention of pressure ulcers in an institution (Kallman & Suserud, 2009:335).

Based on the literature review of pressure ulcers, a discussion follows on the knowledge, the attitude of nurses and barriers towards pressure ulcer prevention.

2.11 Nurses' knowledge, attitude and barriers towards pressure ulcers' prevention in developed countries, Africa and Botswana

Awareness about the significance of the problem, a positive attitude towards prevention, and an adequate level of knowledge are cornerstones to effective prevention of pressure ulcers (Dilie & Mengistu, 2015:1). Lack of knowledge and skills in pressure ulcers' prevention contributes substantially to the occurrence or deterioration of pressure ulcers. Although evidence-based guidelines for the prevention of pressure ulcers have been developed, and have been supported globally, the problem is still widely spread in health care facilities around the world. Knowledge and positive attitudes are necessary to provide quality health care (Kaddourah *et al.*, 2016:1). There is insufficient data in Botswana about pressure ulcers' prevention, hence the need for this study, which aimed to investigate nurses' knowledge, attitudes and barriers towards the prevention of pressure ulcers in Botswana. Therefore, knowledge will be imparted to the stakeholders in Botswana by the researcher through the presentation of research findings.

2.11.1 Knowledge of nurses on pressure ulcers prevention in developed countries and Africa

Nurses' knowledge of pressure ulcer prevention is crucial and mediates preventive care. However, the literature does not indicate whether nurses' knowledge of pressure ulcer

prevention is adequate. To ensure progress in implementing guidelines, the knowledge among the nursing staff and student nurses should be investigated and assessed with a valid instrument (Gunningberg *et al.*, 2015:1).

Studies have been done in high-income countries. A descriptive, comparative multicentre study in Sweden (Gunningberg *et al.*, 2015:4) revealed that that only 26.5% of registered nurses knew that lack of oxygen in the tissue causes pressure ulcers. In a question about, 'reduction in the amount of pressure and shear', only 26.5% of registered nurses answered correctly and in another question, only 25,5% of registered nurses, correctly answered that pressure in a chair seat can best be reduced by the use of a thick air cushion (Gunningberg *et al.*, 2015:4). Similar results were obtained in a study of Jordan nurses with the lowest score in themes related to pressure ulcer aetiology, preventive measures to reduce the amount of pressure/shear, and risk assessment (Qaddum & Khawaldeh, 2014:1).

The study in Sweden (Gunningberg *et al.*, 2015:4) also found that the prevention knowledge of all levels of nurses was unacceptable or borderline with the knowledge of registered nurses at only 59.3%. The study further indicated that about 20% of the nursing staff reported that their patients did not need pressure-reducing mattresses. This suggests a knowledge deficit, as these nurses worked in orthopaedic, surgical, medical and palliative wards where most of the patients are elderly - age of 70 years or above (Gunningberg *et al.*, 2015:5). Therefore, the researchers concluded that a major educational campaign needs to be undertaken both in hospital settings and in nursing education. Emphasis should be on understanding the aetiology of pressure ulcers and addressing pressure-reducing interventions for patients at risk of developing pressure ulcers (Gunningberg *et al.*, 2015:6).

A study conducted in Belgium nursing homes in 2008, concluded that only 6.9% of patients who were at risk, received fully compliant prevention care. The study further identified that the mean percentage of the knowledge of nurses on pressure ulcers was 29.3% (Demarré *et al.*, 2012:1425). This study illustrated the knowledge deficit among nurses towards the prevention of pressure ulcers.

A direct observational study conducted in two German hospitals indicated that nurses had poor knowledge on causes, prevention and importance of multidisciplinary care about pressure ulcers (Hoviattalab *et al.*, 2015:1521).

Chianca *et al.* (2010:45) conducted a study in Brazilian nurses that revealed knowledge deficits in the area of pressure ulcer prevention and assessment (staging), especially among nurses who had been in practise for a longer period. There were some incorrect statements about PU prevention practises, which were marked as correct instead of false, such as the use of

doughnut or ring cushions or water gloves. This suggested knowledge deficiencies among nurses.

The study of Iranmanesh *et al.* (2013:3) conducted in Iran to assess orthopaedic nurses' knowledge about pressure ulcers, showed that nurses were not sufficiently knowledgeable about pressure ulcers, with a mean score of 74% on prevention items and 65% for the classification item. Most of the orthopaedic patients do not move freely because of the nature of their conditions. Similarly, findings that critical care nurses were not knowledgeable about pressure ulcers were found in South-East Iran (Iranmanesh *et al.*, 2011:461).

A few studies were conducted in Africa. According to Taha, (2014:260), a study aimed to assess nurses' knowledge and practises related to pressure ulcers in intensive care units at Benha University and Benha Teaching Hospital in Egypt showed inadequate nurses' knowledge regarding risk assessment, skincare, management of mechanical loads and educational programmes for patients, family and staff. The knowledge aspects had unsatisfactory results at 70%. The practise regarding pressure ulcer prevention and management scored 67%, which was graded unsatisfactory. A teaching hospital should have adequate knowledge about pressure ulcers to inform the teaching and learning of their students.

In Ethiopia, a study was conducted in Addis Ababa's Government hospitals and found that 38.8% of nurses had inadequate knowledge of pressure ulcer prevention practise. The number of nurses with inadequate knowledge was 73% in Jordan (Dilie & Mengistu, 2015:9). Knowledge deficit among nurses on pressure ulcer prevention is still identified as the major problem.

The study conducted at a Ugandan teaching hospital showed that nurses did not have adequate knowledge of pressure ulcer development and its stages. Nurses again portrayed poor knowledge on multidisciplinary care, and they did not know the prognosis of unpreventable and unmanaged pressure ulcers that often lead to permanent disability and bone destruction. Participants also had inadequate knowledge about the need for a balanced diet among patients at risk (Mwebaza *et al.*, 2014:4). This indicates the educational needs among nurses on pressure ulcers' prevention.

A descriptive study carried out in the University Teaching Hospital Maiduguri (UMTH), Borno State, Nigeria, demonstrated nurses' knowledge deficit in core areas on pressure ulcers, as 73% of nurses demonstrated a low-level identification/staging, 69.4% demonstrated an average level of knowledge of risk factors' assessment at 69.4% and 79.9% demonstrated a high-level knowledge of preventive practices at 79.9% (Akese *et al.*, 2014:1).

Furthermore, Ilesanmi *et al.* (2012:24) conducted a pilot study in Ogun State, Nigeria, showing that 70.3% of nurses had low prevention intervention knowledge scores. The results of the study confirmed that many PU prevention interventions in Nigeria were based on tradition, myth and past experiences like massaging bony prominences and use of ring/doughnut cushions, which was done by 32.6% of nurses and believed by 100% of nurses as an appropriate measure. The study further noted the lack of consistency in turning frequency of patients. The conclusion for the Nigerian study was that there is a need for structured educational approaches to enable Nigerian nurses to provide evidence-based PU prevention interventions. Lack of knowledge among nurses on pressure ulcers prevention is also evident in African countries.

2.11.2 Knowledge of nurses on pressure ulcers prevention in Botswana

Prevalence, prevention and care related to pressure ulcers are rarely researched, and measurement of nurses' knowledge is inadequate in low-income countries like Botswana. However, a prospective follow-up study was conducted at the spinal cord injury rehabilitation centre in Princess Marina Hospital, Botswana. The study showed that 16 out of 39 spinal cord injury patients included in the study developed pressure ulcers. Among those patients, five had developed pressure ulcers before admission to this hospital, eight patients developed pressure ulcers at other wards in the hospital, before being transferred to the rehabilitation centre, and three patients developed pressure ulcers during rehabilitation (Löfvenmark *et al.*, 2017:3). The high incidences of pressure ulcers may indicate a lack of knowledge among nurses in Botswana.

Finally, nurses from different studies portrayed knowledge deficits that exist regarding pressure ulcers prevention in developed and undeveloped countries. Therefore, there is a need for education on pressure ulcers prevention among nurses. The nurses must have the knowledge to fulfil their duty to monitor skin changes in their patients in order to plan, implement and evaluate interventions that maintain skin integrity.

2.11.3 The attitude of nurses towards pressure ulcers prevention in developed countries and Africa

Attitude is an evaluation of an object of thought that includes feelings, thoughts or beliefs that lead to specific actions, so that attitude may influence the decisions or guide the behaviour of an individual (Unver *et al.*, 2013:278). According to Unver *et al.* (2013:278) determining nurses' attitudes towards pressure ulcer prevention may identify their behaviours and beliefs about pressure ulcer care. Moreover, negative attitudes towards pressure ulcer prevention are one of the principal obstacles to evidence-based care and affect preventive care strategies. Therefore,

it is generally accepted that clinical nurses should have positive attitudes about the prevention of pressure ulcers (Ünver *et al.*, 2017:278).

Several studies have investigated nurses' attitudes regarding pressure ulcer prevention. A study conducted in Belgium nursing homes in 2008, revealed that 78.3% of registered nurses showed a positive attitude towards pressure ulcers (Demarré *et al.*, 2012:1425).

Furthermore, another study conducted in Sweden in 2011 indicated that 20% of the nursing staff had a negative attitude towards pressure ulcers with more than a quarter of the patients at risk of developing pressure ulcers not receiving a pressure-reducing mattress (Gunningberg *et al.*, 2015:5).

Likewise, a study conducted in Addis Ababa Government hospitals, Ethiopia in 2015 found that only 68.4% of the participants had a favourable attitude toward pressure ulcer prevention practice (Dilie & Mengistu, 2015:9). This is much lower than a survey done in Sweden where nursing staff as a whole demonstrated a positive attitude regarding pressure ulcer prevention and in Iraq where 99% of the nurses had a positive attitude toward pressure ulcer prevention practice (Dilie & Mengistu, 2015:9).

2.11.4 Attitude of nurses towards pressure ulcers prevention in Botswana

In Botswana, as already mentioned, there is insufficient literature on pressure ulcers, and knowledge of nurses' attitude is also inadequate. A prospective follow-up study conducted at the spinal cord injury rehabilitation centre in Princess Marina hospital, Botswana, observed that the basic care at Princess Marina referral hospital's general wards is lagging, resulting in high rates of pressure ulcers that significantly extend hospitalisation periods (Löfvenmark *et al.*, 2017:1). It can be deduced that the nurses portray a negative attitude towards the patients at risk of pressure ulcers, which result in the development of pressure ulcers and prolonged hospital stay.

Attitude is learned and is affected by knowledge and behavioural intent. It is used to express positive or negative feelings about pressure ulcers' prevention (Ünver *et al.*, 2017:278). As a result, if nurses have a positive attitude toward PUP, this will increase the possibility of performing preventive measures.

2.11.5 Barriers experienced by nurses in the prevention of pressure ulcers in developed countries and Africa

Several studies (Mwebeza *et al.*, 2014:3; Worsley *et al.*, 2017:306; Tallier *et al.*, 2017:108), found that prevention of pressure ulcers is negatively affected by the shortage of staff, lack of

time, lack of knowledge and insufficient equipment. Inadequacies of supplies for pressure prevention and shortages of human resources, particularly nurses, heavy workload and shortage of pressure-relieving devices are often mentioned as barriers to carrying out appropriate pressure ulcer prevention strategies. Patients are considered a barrier when they are uncooperative. Poor access to pressure ulcer literature and inadequate coverage about pressure ulcers during training are also considered barriers (Mwebeza *et al.*, 2014:3; Worsley *et al.*, 2017:306; Tallier *et al.*, 2017:108).

A study carried out in Mulago Teaching Hospital in Uganda identified heavy workload related to the shortage of staff at 94.6% as the main barrier to prevent pressure ulcers. Patients that are uncooperative were also considered a barrier by 62.5% respondents. Other barriers were poor access to pressure ulcer literature at 37.5% and inadequate coverage of pressure ulcers during training at 23.2% (Mwebeza *et al.*, 2014:4).

According to the study of Delie and Mengistu (2015:2), nurses indicated that disproportionate nurse to patient ratios, lack of policies and guidelines and lack of job satisfaction were negatively associated with pressure prevention. A study carried out in Jordan noted lack of time and shortage of staff as priority barriers (Qaddum & Khawaldeh, 2014:5).

Likewise, a cross-sectional descriptive study carried out in a Swedish University hospital, identified that time, priorities and severely ill patients and knowledge and access to pressure relieving equipment were the most prominent barriers to the prevention of pressure ulcers (Strand & Lindgren, 2010: 338).

2.11.6 Barriers experienced by nurses in the prevention of pressure ulcers in Botswana

Literature about barriers encountered by nurses in PUP is insufficient in Botswana. The prospective follow-up study conducted at the spinal cord injury rehabilitation centre in Princess Marina Hospital in Botswana found that significant challenges in prevention of pressure ulcers in this hospital were; lack of pressure relief mattresses, limited knowledge among staff, and that the hospital is understaffed, which challenges frequent turnings (Löfvenmark *et al.*, 2017:1). These challenges were also cited in developed countries and some of the other African countries.

2.12 Conclusion

This chapter discussed causes of pressure ulcers as lack of oxygen which causes tissue ischemia. Pressure, shear, friction and moisture were found to be important extrinsic factors that predispose patients to the development of pressure ulcers. Malnutrition, advanced age, immobility and impaired sensory function were also considered as intrinsic predisposing factors.

Therefore, nurses need to possess knowledge of the pathophysiology for pressure ulcer development and its contributing factors in order to perform risk assessments and preventive measures. This type of knowledge can enhance the nurses' performance of identifying patients at risk for pressure ulcer development. Awareness about the significance of the problem, a positive attitude towards prevention, and an adequate level of knowledge are cornerstones to effectively prevent pressure ulcers. The next chapter will discuss the research methodology of this study.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, the researcher addresses methodology, study design and ethical considerations. In line with the research questions, the researcher aimed to describe nurses' knowledge, attitudes, and barriers encountered towards pressure ulcer prevention in the two selected referral hospitals of Botswana. This chapter presents a complete account of how this research has been planned, structured and executed.

3.2 Research design

The researcher adopted a non-experimental cross-sectional descriptive study design to gather information from a representative sample of the selected population using a questionnaire. This questionnaire aimed to investigate the nurses' knowledge, attitude and barriers towards pressure ulcer prevention in the two selected referral hospitals of Botswana.

Brink *et al.* (2012:112) state that quantitative research designs are categorised according to the level of scientific rigour in describing the variables in order to answer research questions and there is no intention of providing the cause and effect relationship. The quantitative research designs include experiments, surveys, questionnaires and content analysis. Fouché *et al.* (2011:144) classify quantitative research designs into two main categories, namely experimental and non-experimental designs. This study used a non-experimental design. The non-experimental design involves variables that are not manipulated by the researcher and instead are studied as they exist (Brink *et al.*, 2012:112; Fouché *et al.*, 2011:144).

A cross-sectional study design was applicable because the study is descriptive and is in the form of a survey. A cross-sectional study is done at a specific time when all information is collected at the same time from participants and no identical study will be done after a specific period (Brink *et al.*, 2012:100). The data was collected at one point in time and in a specific population, thus feasible in this research, which is acceptable on the Master's degree level (Brink *et al.*, 2012:112).

3.3 Research methodology

The methodology is concerned with rules and procedures that specify how the researcher must study and investigate what must be known. It guides the researcher to acquire appropriate knowledge (Botma *et al.*, 2010:41). The study utilised quantitative methods because it is measurable, is transparent, has internal validity, and the findings can be generalised to the

population. The data were collected systematically, objectively and was reduced to numbers and analysed statistically (Brink *et al.*, 2012:97). A thorough review of the literature identified both theoretical and empirical literature on the current knowledge on nurses' knowledge, attitudes and barriers regarding pressure ulcers' prevention globally. However, it revealed a gap in the literature from the perspective of selected hospitals in Botswana. The researcher aimed to address this gap with empirical data collected using questionnaires. The data analysis in quantitative methods provides a synthesis of findings from the current study, by incorporating logic and deductive reasoning (Burns & Grove, 2011:192; Brink *et al.*, 2012:11).

3.4 Study context

The context of the study is public hospitals in Botswana in Southern Africa. Botswana is a landlocked country; surrounded by South Africa, Namibia, Zimbabwe and Zambia. Botswana is a relatively large country, with a total surface area of 600,370 square kilometres. The population of Botswana is approximately 2 million, with most people living in the southwest corner of the country. Most of central Botswana consists of the mostly uninhabitable Kalahari Desert. The country is best known for tourism and has thriving safari parks in the north. Its economy is further based on diamond mining and cattle herding. The climate of Botswana is semi-arid. The official languages in Botswana are Setswana and English (Introcaso & Kovarik, 2011:64; Caruso *et al.*, 2011:109).

Botswana has three public referral hospitals: Princess Marina Hospital in Gaborone; Nyangabwe Hospital in Francistown; and S'brana Psychiatric Hospital in Lobatse. The study focused on the two referral hospitals that admit medical and surgical patients and encounter pressure ulcers in most wards. The third referral hospital was not included in the study since it deals with acute and chronic psychiatric patients who are surgical and medically stable and rarely encounter pressure ulcers in its practice.

Princess Marina Hospital (PMH) is a 567-bed facility in the capital city of Botswana, Gaborone, with 593 registered nurses (Bareki & Tenego, 2018:3). The hospital sits at the apex of the public sector referral pyramid in Botswana. It offers a complete range of speciality and sub-speciality services. PMH also serves as the primary and secondary hospital for residents of Gaborone and its surrounding areas. PMH is the primary teaching hospital for the University of Botswana, Institute of Health Sciences and other health professionals (Chandra *et al.*, 2014:110). Patients include those self-referred ("walk-in population") and those referred from area clinics, and other hospitals in Botswana (Chandra *et al.*, 2014:110; Loudon, 2016:6).

The second referral hospital is in Francistown, the second largest city of Botswana. It caters for the Northern region. Nyangabgwe Referral Hospital (NRH) is the only tertiary hospital in

Francistown and used as a teaching hospital (Madondo *et al.*, 2012:124). According to Madondo *et al.* (2012:21), the hospital has a bed capacity of approximately 500. The hospital employs approximately 450 registered nurses (Kapungumberi, 2018:20).

3.5 Population and sampling

The population (N) is described as a collection of elements that the researcher is interested in (Brink *et al.*, 2012:131). In this study the researcher is interested in general nurses in Botswana. Sampling is defined as a selection of a subset of individuals from within a population to estimate the characteristics of the whole population (Singh & Masuku, 2014:3).

3.5.1 Population

In this study, the population were registered nurses in Botswana. The target population were registered nurses in the two referral hospitals in Botswana. The focus population were registered nurses with at least six months' working experience. That means they might have gained exposure in nursing patients with pressure ulcers. The accessible population were 300 registered nurses from the two referral hospitals who are working in medical wards, surgical wards, orthopaedic wards, in the Spinalis unit (unit for spinal injuries), infection control unit, wound care unit, operating theatre, oncology ward and intensive care unit.

3.5.2 Sampling

Sampling is related to the selection of a subset of individuals from within a population to estimate the characteristics of the whole population (Singh & Masuku, 2014:3). The following aspects will be discussed: sampling technique, sampling size, inclusion and exclusion criteria.

3.5.2.1 Sampling technique

The rationale for the sampling techniques chosen by the researcher was to ensure the feasibility of the study in terms of low cost and time with relatively good precision. The selection of sampling methods and determination of the sample size are critical to drawing correct conclusions (Singh & Masuku, 2014:3).

This study deployed survey sampling. In survey sampling the researcher uses information gathered from the survey to generalise findings from a drawn sample back to a population, within the limits of random error, handling missing data, and analysis of the observations to make estimates of population characteristics (Kotrlík & Higgins, 2001:43). It also minimises both alpha error (finding a difference that does not exist in the population) and beta error (failing to find a difference that exists in the population) (Brick, 2011:873; Kotrlík & Higgins, 2001:43). A

questionnaire was used in this study to gather information from a sample of nurses about their knowledge, attitudes and barriers towards pressure ulcers' prevention in order to infer the findings to the population of nurses in the selected referral hospitals in Botswana.

3.5.2.2 Sampling size

The sample size (n) was 300 participants from the two referral hospitals. These are registered nurses from the accessible population. Of these, 173 respondents were selected from Princess Marina hospital and 127 respondents from Nyangabgwe Referral hospital based on the power calculation of the study. A power calculation was used to select an appropriate number of respondents from both hospitals. The power of a study is the probability of successfully detecting the effect of a particular size (Purcell *et al.*, 2003:149). It avoids bias by not taking equal numbers of respondents from both hospitals since there were more nurses from PMH than from NRH. A statistician of the NWU (North-West University) assisted the researcher in determining the sample size (Singh & Masuku, 2014:3). The final sample size of respondents was 228, of which 121 were from Princess Marina hospital and 107 were from Nyangabgwe Referral hospital.

3.5.2.3 Inclusion criteria

The inclusion criteria were all registered nurses who are registered with Botswana Nursing and Midwifery Council, who have six months or more years of experience and who work permanently in either of the two referral hospitals mentioned above. Only nurses working in the following wards were included:

- Medical wards
- Surgical wards
- Orthopaedic wards
- Spinalis Unit (the official name of the spinal injury unit). The Spinalis unit is a rehabilitation centre in Princess Marina hospital for post-traumatic spinal cord injury, established in a partnership between Botswana and the Spinalis foundation of Sweden.
- Infection control unit
- Wound care unit
- Operating theatre

- Oncology ward
- Intensive unit

Specific wards and units were chosen because nurses allocated to work in these wards often encounter pressure ulcers in their daily nursing practice. Even though the researcher could not obtain the statistics of pressure ulcer prevalence in these wards in Botswana, a literature review indicated that these wards are mostly affected by pressure ulcers. All units in which there were likely to be patients with pressure ulcers, including the medical, surgical, orthopaedics unit, operating room and critical care units at each selected hospital were listed (Kharabsheh *et al.*, 2014:114; Gunningberg *et al.*, 2001:2; Ünver *et al.*, 2017:278).

3.5.2.4 Exclusion criteria

The exclusion criteria were registered nurses who were not practising, who were on leave during data collection, and those who had less than six months of experience and who were working in the following wards:

- Paediatric wards
- Neonatal ward
- Private Ward
- Renal care
- Gynaecology ward
- Out-patients department
- Maternity wards

Nurses from these wards were excluded because it was less likely for nurses to encounter pressure ulcers in these areas of practice. Literature also did not cite these wards as likely to be affected (Jiang *et al.*, 2014:2589).

3.6 Recruitment of participants

After the proposal had been approved by the scientific committee of the relevant research entity (NuMIQ research focus area), the researcher requested ethics approval from the Human Research Ethics Committee (HREC) of the North-West University, which was granted (Ethics number: NWU-00017-18-S1). (Appendix A). Thereafter, the Ministry of Health of Botswana was

approached for permission to conduct this research in the two referral hospitals and permission was granted (HPDME 13/18/1). (Appendix B). After the Ministry of Health of Botswana granted permission, the ethics committees of the two hospitals were contacted for ethical clearance. Both hospitals, Princess Marina Referral Hospital (PMH 5/79(400-1-2019) (Appendix C), and Nyangabgwe Referral Hospital (NRH 1/2/17) granted permission for the study (Appendix D).

After all approvals were received, the researcher recruited participants. The researcher arranged meetings with the hospital nurse managers and unit nurse managers to explain the research proposal and obtain goodwill permission from them (Appendices E and F). On these meeting days, the researcher explained the following: the topic of the research, research objectives, inclusion criteria, exclusion criteria, consent forms, ethical considerations including the right of the participants to choose whether to participate or not, and the right to withdraw even after signing the consent forms, study benefits, and how the researcher will conduct the research in their units. The nurse unit managers were also informed that participants were given two days to study the informed consent forms so that they can make an informed decision to participate. The researcher allowed the nurse unit managers to ask questions and attended to any queries about the study. The meetings were done in two days, (one day at each hospital) and each meeting took two hours in the hospitals' conference rooms at the administrative block. Refreshments were provided by the researcher.

The officers from the Ministry of Health Ethics Committee were the gatekeepers since they granted access to the potential respondents. The nurse unit managers were asked to act as mediators to liaise between the research respondents and the researcher. They were first trained to be mediators, as they had to be knowledgeable about the research study. The mediators introduced the researcher and informed the respondents what the research was all about and what was expected from them. The unit managers also distributed consent forms and allowed the respondents to study the informed consent as agreed by the researcher. After that, the researcher communicated with the nurse unit managers to arrange appropriate dates on which the researcher could meet with the respondents to further explain the research study to them.

The recruitment material consisted of a pamphlet (Appendix H), which was handed out during the change of shifts (morning, evening and night shift) and during tea breaks at the nurses' day room, and the nurses' station after the unit manager introduced the researcher. The information session was conducted by the researcher and took 20-30 minutes. The researcher addressed the respondents in an informal session. The researcher was ready to attend to any questions and comments from the respondents. The respondents reported that the recruitment pamphlet was clear, and they had no questions. After that, the researcher handed the informed consent to

the respondents who did not yet receive the informed consent form from the unit manager to read at home. During the informal information session, refreshments were served.

3.7 Process of obtaining informed consent

The informed consent documents (Appendix G) were distributed and discussed after recruitment. After recruitment, the interested respondents consulted with the nurse unit managers who acted as mediators. The respondents were given two days to read the informed consent information and think about it so that they could make an informed decision.

The signed consent forms were dropped in a central box at the out-patient department, which was managed by a registered nurse who was asked to guard it until the researcher could collect it. The researcher collected the box in the evenings at 16:30 hours when the out-patient department was closed.

3.8 Data collection

Data collection begins after a research problem has been defined, and the research design described (Kothari, 2004:100). The data collection tool and data collection process are discussed under the following headings:

3.8.1 Data collection tool

A structured self-reporting questionnaire about pressure ulcers' prevention was used to describe nurses' knowledge, attitudes and barriers towards pressure ulcers' prevention in the two referral hospitals in Botswana (Appendix I).

The instrument consisted of four sections; socio-demographic information, knowledge, attitude and barriers. Section one had seven socio-demographic questions, which were adapted from a questionnaire previously used to describe the knowledge, attitude and practice of nurses regarding pressure ulcer prevention in Ethiopia (Etafa, 2015). Only the socio-demographic (Appendix J) and the section concerning barriers from this questionnaire were used (Appendix M). Permission to use this instrument was requested (from Etafa) and granted (Appendix J and Appendix M, as indicated on the original instrument). Some amendments were made to fit the context of this study with the guidance of a statistician and the study supervisors (Appendix I).

Section Two and three on knowledge and attitudes of pressure ulcer prevention were based on two instruments, namely the knowledge instrument that was developed by Beeckman and used in the Netherlands in 2008 (Beeckman *et al.*, 2010a:1438) (Appendix K). The knowledge assessment instrument consisted of twenty-six multiple-choice questions with four answer

options, addressing six domains, expressing the most relevant aspects of pressure ulcer prevention, namely:

- Aetiology and development
- Classification and observation
- Nutrition
- Risk assessment
- Reduction of the magnitude of pressure and shearing
- Reduction of the duration of pressure and shearing

The original instrument had three answers options which were adapted. Amendments were made to simplify the language and the addition of a fourth option (I don't know) was added (Appendix I) to allow the respondents to answer all questions by indicating whether they don't know the answer.

The attitudes assessment instrument (section 3) was developed by Beeckman in Belgium in 2008 (Beeckman *et al.*, 2010a:1438) (Appendix L). The original instrument consisted of thirteen items and reflected five subscale domains; personal competency to prevent pressure ulcers, the priority of pressure ulcer prevention, the impact of pressure ulcers, responsibilities in pressure ulcer prevention, and confidence in the effectiveness of prevention. The original scale had a 4-point Likert scale (Appendix L) which was adopted for this study (1=strongly agree, 2=agree, 3=disagree, and 4=strongly disagree) (Appendix I).

Permission to use the two instruments on knowledge and attitude was requested from the developer (Beeckman), which was granted through e-mail correspondence (Appendix N). The knowledge and attitudes instruments were also used in seven Italian nursing schools to assess nursing students' knowledge and attitudes on pressure ulcers' prevention, contributing to evidence-based guidelines and supporting similar results as studies done in Belgium and the Netherlands (Simonetti *et al.*, 2015:577).

Section four was the barriers to pressure ulcers' prevention. The barriers assessment instrument consisted of thirteen items with answer options, Yes or No which were adopted and used. The barriers encountered in the pressure ulcers' prevention instrument was developed by Etafa and used in Ethiopia (Etafa, 2015). Permission to use the question was granted by Etafa (Appendix M).

3.8.1.1 Validity and reliability of the data collection tool

Beekman *et al.* (2010b:399) found that the content validity of the original 26 knowledge item instrument reflecting six themes expressing the most relevant aspect of pressure ulcers' prevention was found to be excellent by the developer. The Content Validity Index (CVI) was 0.78-1.00. The scores of nurses with a high level of expertise were found to be statistically significantly higher than those of participants with less expertise ($P\text{-value} < 0.001$). The item difficulty index of the questions ranged from 0.27 to 0.87, while value discrimination ranged from 0.29 to 0.65). The overall internal consistency reliability (Cronbach's α) was 0.77. The instrument was valid and reliable to be used to assess nurses' knowledge (Beeckman *et al.*, 2010b:399).

The content validity of the original attitude instrument was evaluated by nine European pressure ulcer experts and five experts in psychometric instrument validation in a double Delphi procedure. All 13 items indicated a factor loading of over 0.60. The attitude pressure ulcers' prevention instrument is valid to assess attitude towards pressure ulcers' prevention (Beeckman *et al.*, 2010a:1432). The attitudes instrument (Cronbach's α) was 0.79. The overall intraclass correlation coefficient (ICC) was 0.88. The confidence interval (CI) was 0.84 to 0.91, $P\text{-value} < 0.001$ (Beeckman *et al.*, 2010a:1432). The original instrument had content validity and was reliable.

The socio-demographic and barriers questionnaire was previously used in Ethiopia. To evaluate the consistency of the questionnaires, a pilot run was conducted among nurses working in St. Peter hospital which is not included in the study. The selection was by lottery method among the hospitals not included in the study on 9% ($n=33$) of the sample size, one week before the actual data collection using self-administered questionnaires. The study subjects were selected by simple random sampling and included those who met the inclusion criteria. The internal consistency reliability (Cronbach's α) was 0.76. The validity of the instrument was assessed by nursing instructors holding a Master of Science in Nursing (assistant professors) and had research experience ($n=3$) before and after pilot study (Etafa *et al.*, 2018:24).

For this study, the reliability and validity of data collection were ensured through the use of already established reliable and valid instruments which were published in journal articles. The statistician and the study supervisors rechecked the reliability and validity of the data collection instrument, and it was found that the instrument performs as intended.

After data collection, the reliability of the knowledge assessment section of the current study instrument was found not to be reliable as the group Cronbach's alpha was 0.440 (reliability is acceptable if the Cronbach's alpha is more than 0.5). The subsections of the knowledge section

were also not reliable. As the knowledge assessment measuring section was not reliable. Reliability improved by individual measuring. For the total 13 items on attitude, the internal consistency (Cronbach's α) was 0.624 which indicates that the total attitude score is reliable as it is above Cronbach's alpha of 0.5. Reliability of the data collection process is further elaborated on in section 4.2.

3.8.2 Data collection process

The researcher communicated with the respondents about suitable dates and times for data collection in their wards or units during the recruitment process. The researcher was available during data collection to clarify any questions the respondents might have had about both the informed consent and the questionnaire. Respondents who agreed to participate in the study and who signed the informed consent forms were given questionnaires to complete, allowed to have some private time and find a quiet space to complete the questionnaire.

The sample size was 300 participants, but the sample could not be reached as some potential respondents were not interested in participating in the research due to workload and shortage of time. A total of 228 informed consent forms and questionnaires were handed to interested respondents. All 228 questionnaires distributed were completed on duty using available spaces at day rooms, nurses' offices, counselling rooms, conference rooms and the doctors' offices within the units. Respondents were requested to use 10-15 minutes of their 30 minutes of tea-time to complete the questionnaire. Respondents who wanted to complete the questionnaire at home were not allowed to do so, because of the knowledge questions contained in the questionnaire and the possibility that respondents would consult textbooks and conduct internet searches for the correct answer. Two hundred and twenty-eight (228) informed consents and questionnaires were completed.

The questionnaires were coded before being given to the participants to ensure anonymity and to monitor how many were issued. All completed questionnaires were dropped in a central box at the Surgical Outpatient Department, managed by a registered nurse. The researcher collected the completed questionnaires from the central box every evening for safekeeping. The researcher was able to complete the data collection process within one month by spending one week per site as planned.

3.9 Data capturing

The researcher was trained by the statistician in the design of the spreadsheet and how to complete the spreadsheet. The questionnaires were checked for completeness of the information and captured by the researcher on a specially designed Excel spreadsheet.

Questionnaires with incomplete data were included since the statistical program and procedures can work with missing values. After that, the researcher submitted the data on the spreadsheet to the North-West University's Statistical Consultation Services to assist with data analysis. Data integrity was ensured with the help of a statistician.

3.10 Data analysis

A statistician of the Statistical Consultation service of the Potchefstroom campus of the NWU advised with the data analysis. Data analysis was done on SPSS Version 25.

Both descriptive and inferential statistics (in this case, hierarchical linear modelling) were used. Descriptive statistics were used to describe and summarise data in an organised and meaningful way in order to assist the reader to make sense of the findings (Brink *et al.*, 2012:179). Descriptive statistics such as frequencies were suitable as they were used to describe various characteristics of data and summarised data so that it was manageable (Brink *et al.*, 2012:179).

Hierarchical linear modelling was used to determine if biographical variables influence knowledge, attitude and barriers. The hierarchical linear modelling accommodated missing data, small and discrepant group sample sizes, and heterogeneity of variance across repeated measures (Woltman *et al.*, 2012:56). The T-test was used to compare two groups, for example, whether gender had an impact on knowledge while Analysis of Variance (ANOVA) was used to compare more than two groups. The results were interpreted, the researcher extracted meaning, and then discussed and presented it in the form of tables and graphs in chapter 4.

3.11 Conclusion

This chapter described how the research design and methodology were employed in each step of the study. The processes of sampling, data collection and data capturing as well as data analysis were described. The validity and reliability of the original instrument which was adopted and used were discussed. Finally, the validity and reliability of the data collection instrument used in the research were discussed. The instrument was found to be valid and reliable to be used to assess nurses' knowledge, attitude and barriers towards pressure ulcers' prevention.

CHAPTER 4: DATA ANALYSIS AND RESULTS

4.1 Introduction

The results reported in this chapter form part of the evidence on the nursing knowledge, attitude and barriers in pressure ulcers' prevention that might prevent nurses from pursuing the vision of the Ministry of Health and Wellness in Botswana effectively, which is providing quality nursing care. The questionnaires were developed to solicit views from the nurses on the ground in the selected referral hospitals in Botswana. Data analysis was performed on SPSS Version 25. Both descriptive and inferential statistics were used. Data was presented and analysed in frequencies, percentages, tables, graphs and factor analysis. The T-test was used to compare two groups, for example, whether gender had an impact on knowledge. ANOVA was used to compare more than two groups. The findings of this data analysis process are discussed in this chapter.

4.2 Reliability of the data collection instrument

Cronbach's alpha was used to measure the reliability of the instrument (Brink *et al.*, 2012:170). Cronbach's alpha provides a measure of the internal consistency of a test or scale; it is expressed as a number between 0 and 1. Internal consistency describes the extent to which all the items in a test measure the same concept or construct. There are different reports about the acceptable values of Cronbach's alpha, ranging from 0.6 to 0.9 (Sharma, 2016:273). According to Sharma (2016:273), the interpretation of Cronbach's alpha (α) values are as follows: $\alpha \geq 0.9$ is excellent, $\alpha \geq 0.8$ is good, $\alpha \geq 0.7$ is good for practical use, $\alpha \geq 0.6$ is acceptable but α smaller than ($>$)0.5 is poor, and if α is > 0.5 , the internal consistency is unacceptable. A low value of Cronbach's alpha can be due to a low number of questions, poor interrelatedness between items or heterogeneous constructs (Tavakol & Dennick, 2011:53).

4.2.1 Reliability of pressure ulcers prevention knowledge questions

The Cronbach's alpha for the data collection instrument was calculated by the statistician at NWU during data analysis. The knowledge assessment section of the instrument was not reliable as the group Cronbach's alpha was 0.440, which is unacceptable. The subsections were also not reliable. As the knowledge assessment measuring instrument was not reliable, each individual question was addressed individually.

4.2.2 Reliability of attitude scale towards pressure ulcers prevention

For the 13 attitude items, the internal consistency (Cronbach's α) was 0.624, which is acceptable. Based on the results of the Cronbach's alpha of 0.624, one question was deleted in the theme 'Priority of pressure ulcer prevention'. The question that was deleted was; 'too much attention goes to the prevention of pressure ulcers' (F 2.1). In the theme 'Impact of pressure ulcers' the question 'the financial impact of pressure ulcers on a patient should not be exaggerated (F 3.2)' were deleted. These questions were removed because they were not clearly understandable on advice from the statistician as their reliability were questionable. The construct of the instrument was changed accordingly (see figure 4-13).

Table 4-1: Overview of respondents' attitude reliability instrument on PUP

	Cronbach's Alpha	Mean	Std Deviation
Attitude overall	0.624	1.78	0.48
Personal competency	0.610	2.25	0.75
Responsibility	0.588	1.60	0.78
Confidence prevention	0.771	1.78	0.86

The table above shows the overall Cronbach's alpha for the attitude scale was 0.624. The personal competency Cronbach's alpha was 0.610. The Cronbach's alpha of the attitude subscale on responsibility was 0.588. The Cronbach's alpha for confidence in prevention was 0.771. The Cronbach's alpha result for the attitude questions was found to be reliable. Therefore, the instrument could be used to assess attitudes towards pressure ulcer prevention. The same instrument was used in Belgium with Cronbach's alpha (α) ranging from 0.76 to 0.81 (Beeckman *et al.*, 2011:169) and the Netherlands with a Cronbach's alpha score at 0.79 (Beeckman *et al.*, 2010:1432a).

4.2.3 Reliability of barriers scale on pressure ulcers prevention

Before the reliability of the barrier scale could be determined, exploratory factor analysis was conducted to establish validity. The Bartlett test of sphericity indicated that the correlations did not happen by chance, and there was justification for the factor analysis. There was an adequate sample for the factor analysis based on the Kaiser Meyer Olkin (KMO) of 0.707. After testing the instrument in factor analysis, the number of subscales and items was reduced and the grouping of items within the subscales was established. The classifications of barriers were identified as (1) knowledge barriers, (2) psychological draining barriers and (3) resource barriers. The composition of these models was primarily based on meaningful content and theoretical sense. The final model made good theoretical sense and contained fewer similar

items than in the initial version. The Cronbach's alpha for knowledge barriers was 0.688, the psychological draining barriers had a Cronbach's alpha of 0.573 and the resource barriers' Cronbach's alpha was 0.651. The barriers scores were therefore reliable.

4.3 Descriptive statistics

Descriptive statistics such as frequencies and percentages were used to describe various characteristics of the data (Brink *et al.*, 2012:179).

4.4 Biographic characteristics

A total number of 228 nurses from Princess Marina referral hospital (PMH) and Nyangabgwe referral hospital (NRH) were involved in this study. Of 228 respondents, (n=121) 53.1% were from PMH and (n=107) 46.9% were from NRH. An overview of the percentage of participation from both referral hospitals is provided in Figure 4-1.

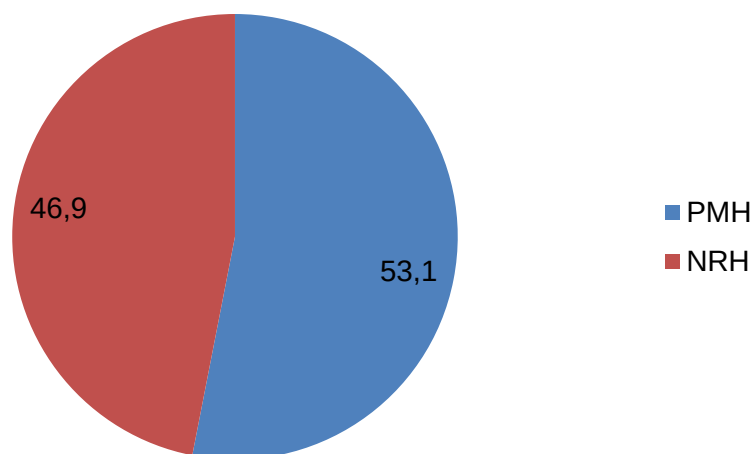


Figure 4-1: Percentage of respondents from the two hospitals

The majority of the respondents were from PMH. The initial sample size was 300 in order to be able to do a good factor analysis, but the researcher only managed to obtain consent from 228 respondents. The planned sample was difficult to obtain due to busy shifts, but 228 was still a sufficient sample to validate the data since the number was supported by the power calculation of the study. The two hospitals were compared to determine which hospital performs better in PU prevention.

Figure 4-2 below shows the sample description of the respondents' gender. In this study, F is for female and M is for male.

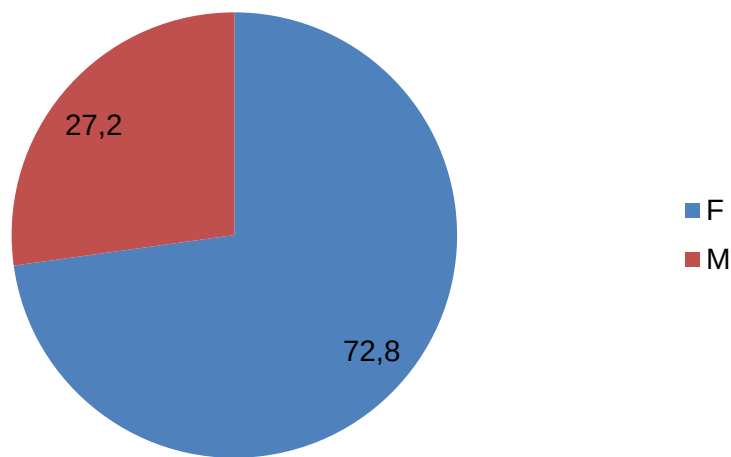


Figure 4-2: Percentage of respondents from each gender

From the total respondents (n=228), Females constituted (n=166) 72.8% of the respondents and males constituted (n=62) 27.1% of the sample. T-test was used to compare the female scores against the male scores to see if gender had an impact on PU prevention.

The age of the respondents was one of the fundamental characteristics and indicated as percentages of specific age categories in figure 4-3. Age was taken into consideration to compare the knowledge of PU prevention across different age categories.

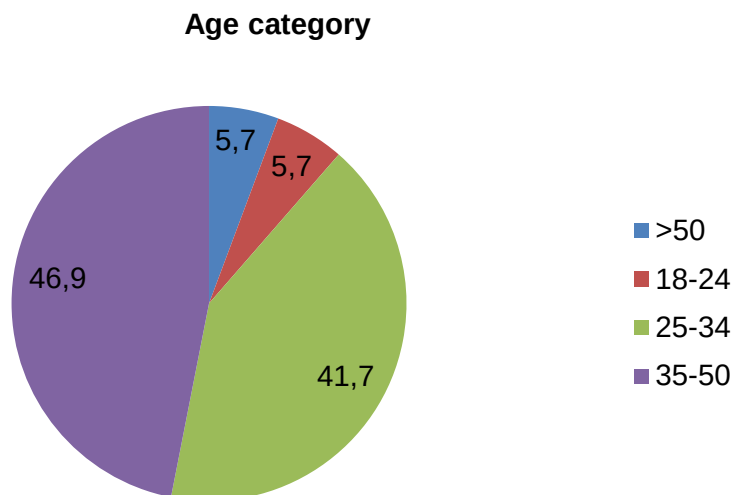


Figure 4-3: Percentage of respondents from each age category

The age of respondents was categorised in 4 age ranges, starting at 18 years and included respondents who were more than 50 years of age. Respondents were mostly (n=107) 46.9% in the age range between 35-50 years. The age ranges that had the least respondents – each

having (n=13) 5.7% respondents were the age groups, of 18-24 years old and more than 50 years. This corresponds to the nursing workforce globally (Sherman *et al.*, 2013:899).

The qualifications of the respondents are also presented as percentages, as indicated in Figure 4-4. The types of qualifications were used to determine the impact of the level of education on PU prevention.

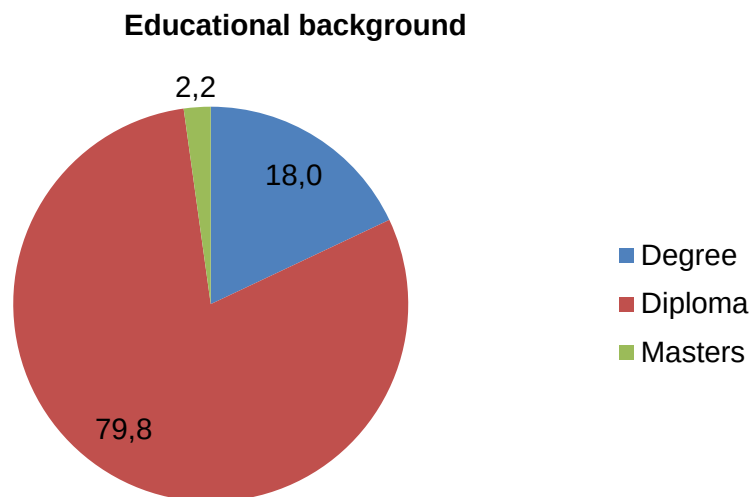


Figure 4-4: Educational backgrounds of the respondents

Most nurses (n=182), 79% had a diploma in general nursing. The respondents with a Master's degree in nursing were the smallest group (n= 5) 2.2%. No literature could be found to support whether the curriculum for diploma nurses, Bachelor's degree nurses or nurses with Master's degrees included PUP, which could have played a role in the findings which indicated inadequate knowledge on PUP among the nurses across the board. The qualifications in this study are influenced by the number of nurses Botswana produces each year. According to Klopper and Uys (2013:35) 600 new diplomas, between 80 and 100 Bachelor's degrees and between 12 and 20 Master's degrees are awarded each year in Botswana.

Another characteristic of the respondents that were considered were the years of experience, as indicated in Figure 4-5. This is important to describe how knowledge, attitude and barriers regarding PU prevention are correlated with years of experience.

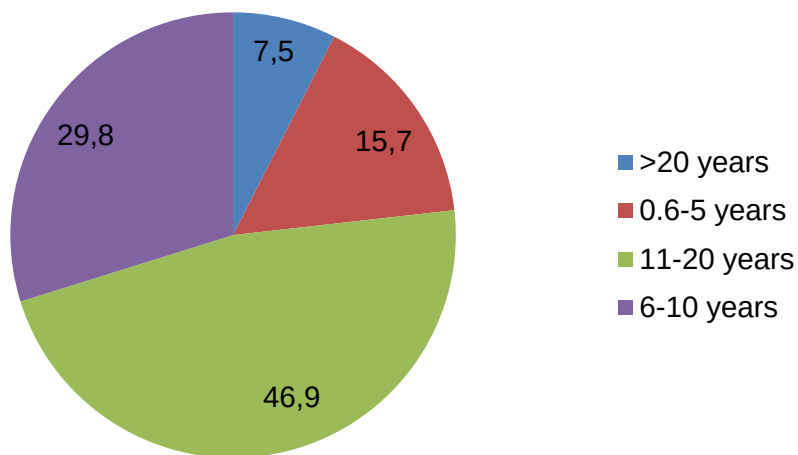


Figure 4-5: Percentage of respondents from each category of years of experience

The most dominant category was those nurses with 11 to 20 years of experience (n=107) 46.9% and the smallest percentage of respondents were those who had >20 years of experience (n=17) 7.5%. According to Fako *et al.* (2002:155), these two categories are the most productive age groups since they had acquired sufficient experience in the job, and so they should have a better knowledge of PUP. In this study knowledge deficit was found across all age groups.

The percentage of nurses who responded from each of the wards/units are summarised in Figure 4-6. This was to compare the knowledge of respondents from different wards.

Percentage of respondents from different wards

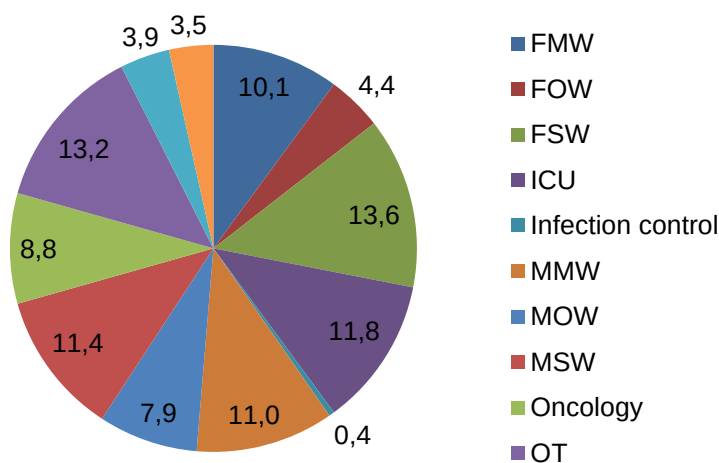


Figure 4-6: Percentage of respondents from different wards

A total of 12 wards from both hospitals participated in this study. The female surgical ward (FSW) from both PMH and NRH had the most respondents at (n=31) 13.6%. The operating theatre (OT) (PMH and NRH) also had a large number (n=30) 13.2% of respondents. The respondents from the Intensive care unit (ICU) from PMH and NRH followed at (n=27) 11.8%. The male surgical ward (MSW) of both hospitals were the fourth largest group constituting (n=26) 11.4% respondents. The respondents from the male medical ward (MMW) (PMH and NRH) was (n=25) 11%. The female medical ward of both hospitals had (n=23) 10.1% respondents. Most nurses from the FSW, OT, ICU, MSW, MMW and FMW were willing to participate in this study. Wards with fewer respondents were the oncology ward with (n=20) 8%, male orthopaedic ward (MOW) with (n=18) 7.9% respondents and female orthopaedic ward (n=10) 4.4%. Most of the nurses from the oncology ward, MOW and FOW were not willing to participate in the research due to various reasons like busy work shifts.

Most nurses from the Spinalis unit (name of the unit for spinal injuries only in PMH) 3.9% (n=9) responded and nearly all participated (the total number of nurses working there is 11). Only a few nurses work in the wound care unit (WC) in both hospitals with four nurses for each hospital and all (n=8) 3.5% of them responded. Few nurses from the infection control unit responded at 0.4% (n=1). Only one nurse working in infection control in NRH responded; the two infection control nurses' in PMH were busy due to their busy schedule. These wards were involved in the study because they experience pressure ulcers prevention in their daily work environment.

This concludes the biographic characteristics of the study. Biographic characteristics are used to compare different features of respondents. After biographic characteristics, the knowledge of respondents regarding PUP was assessed.

4.5 Knowledge of respondents towards pressure ulcers prevention

The Pressure Ulcer Knowledge Assessment instrument (adapted) was used to assess the knowledge of the responding nurses about pressure ulcer prevention. The instrument includes 26 multiple choice questions with four answer options (a to d) and reflects six domains expressing the most relevant aspects of pressure ulcer prevention: (1) aetiology and development; (2) classification and observation; (3) risk assessment; (4) nutrition; (5) reduction of the magnitude of pressure and shearing; and (6) reduction of the duration of pressure and shearing. The frequencies and percentages of the knowledge assessment on the aetiology of pressure ulcers are displayed in Table 4-2. The correct answers are indicated with a ✓ and bolded.

Table 4-2: Frequencies and percentages of correct and incorrect answers on the knowledge of aetiology and development

	Frequency (n)	Percentage (%)
K1 Aetiology and development		
Which statement is correct?		
a. Malnutrition causes pressure ulcers.	41	18
b. A lack of oxygen causes pressure ulcers. ✓	39	17.1
c. Moisture causes pressure ulcers	141	61.8
d. I don't know	7	3.1
K2 Aetiology and development		
Why are the extremely thin patients more at risk of developing a pressure ulcer than obese patients?		
a. The contact area involved is small and thus, the amount of pressure is higher. ✓	198	86.8
b. The pressure is less extensive because the bodyweight of those patients is lower than the body weight of obese patients.	12	5.3
c. The risk of developing a vascular disorder is higher for obese patients. This increases the risk of developing a pressure ulcer	11	4.8
d. I don't know.	7	3.1
K3 Aetiology and development		
What happens when a patient, sitting in bed in a semi-upright position (60°), slides down?		
a. Pressure increases when the skin sticks to the surface.	48	21.8
b. Friction increases when the skin sticks to the surface.	99	43.4
c. Shearing increases when the skin sticks to the surface ✓	64	28.1
d. I don't know	17	7.5
K4 Aetiology and development		
Which statement is correct?		
a. Soap can dehydrate skin, thus causing pressure ulcers.	4	1.8
b. Moisture from urine, faeces, or wound drainage causes pressure ulcers.	128	56.1
c. Shear is the force which occurs when the body slides	82	36

	Frequency (n)	Percentage (%)
and the skin sticks to the surface. ✓		
d. I don't know.	14	6.1
K5 Aetiology and development		
Which statement is correct?		
a. Recent weight loss which has brought a patient below his or her ideal weight increases the risk of pressure ulcers✓	159	69.7
b. Very obese patients using medication that decreases the peripheral blood circulation are not at risk of developing a pressure ulcer	22	9.6
c. Poor nutrition and age have no impact on tissue tolerance when the patient has a normal weight.	14	6.1
d. I don't know	33	14.5
K6 Aetiology and development		
Which of the following is not a contributing factor for pressure ulcer risk?		
a. Age.	28	2.3
b. Dehydration.	16	7.0
c. Hypertension. ✓	176	77.2
d. I don't know	8	3.5

The correct answers are indicated in bold

Table 4-2 indicates that regarding the aetiology and development of pressure ulcers, only (n=39) 17.1% of respondents were aware that lack of oxygen causes pressure ulcers. This result is similar to the results of the study done in Sweden, which showed that only 26.5% of registered nurses knew this fact (Gunningberg *et al.*, 2015:4). A total of 61.8% (n=141) of the respondents indicated that moisture causes pressure ulcers. However, although moisture is a predisposing factor, it is not the cause, indicating that nurses do not know the difference between the causes and predisposing factors of pressure ulcers.

In K2, the respondents displayed a high level of knowledge as (n=198) 86,8% of them answered correctly that extremely thin patients are more at risk of developing a pressure ulcer than obese patients because the contact area involved is small and thus the amount of pressure is higher. On other aspects of aetiology and development, the respondents have a knowledge deficit.

Only (n=64) 28,1% answered K3 on the knowledge of aetiology and development correctly, knowing that sitting in bed in a semi-upright position (60°), promotes sliding down in bed thus increasing shearing when the skin sticks to the surface of the bed. On the same question, nearly half 43.3% (n=99) did not understand how friction occurs.

Most of the respondents 56.1% (n=128), answered K4 incorrectly that moisture from urine, faeces, or wound drainage causes pressure ulcers, whereas these are predisposing factors. On the same question, only 36% (n=92) answered correctly that shear is the force which occurs when the body slides down, and the skin sticks to the surface of the bed.

Question K5, 'recent weight loss which has brought a patient below his or her ideal weight increases the risk of pressure ulcers' was answered correctly by (n=159) 69,7% of the respondents. In the K6 of the section on the aetiology and development of pressure ulcers, only 77.2% (n=176) were aware that hypertension is not a pressure ulcer risk factor.

The nurses' knowledge on the aetiology and development of pressure ulcers as tested by this questionnaire was insufficient as only (n=119) 52% had sufficient knowledge about the theme.

The respondents were also tested on their knowledge about the classification and observation of pressure ulcers.

Table 4-3: Frequencies and percentage of correct answers and incorrect answers on knowledge of classification and observation

	Frequency (n)	Percentage (%)
K7 Classification and Observation		
Which statement is correct?		
a. A pressure ulcer extending down to the fascia is a grade 3 pressure ulcer ✓	69	30.3
b. A pressure ulcer extending through the underlying fascia is a grade 3 pressure ulcer.	57	25
c. A grade 3 pressure ulcer is always preceded by a grade 2 pressure ulcer	52	22.8
d. I don't know.	50	21.9
K8 Classification and Observation		
Which statement is correct?		
a. A blister on a patient's heel is always a pressure ulcer of grade 2.	21	9.2
b. All grades (1, 2, 3, and 4) of pressure ulcers involve loss of skin	97	42.5

	Frequency (n)	Percentage (%)
layers		
c. When necrosis occurs, it is a grade 3 or a grade 4 pressure ulcer ✓	82	36
d. I don't know	28	12.3
K9 Classification and Observation		
Which statement is correct?		
a. Friction or shear may occur when moving a patient in bed ✓	145	63.6
b. A superficial lesion, preceded by non-blanchable erythema is probably a friction lesion	42	18.4
c. A kissing ulcer (copy lesion) is caused by pressure and shear	12	5.3
d. I don't know	29	12.7
K10 Classification and Observation		
In a sitting position, pressure ulcers are most likely to develop on:		
a. Pelvic area, elbow and heel ✓	135	59.2
b. Knee, ankle and hip	29	12.7
c. Hip, shoulder and heel	43	18.9
d. I don't know	21	9.2
K11 Classification and Observation		
Which statement is correct?		
a. All patients at risk of pressure ulcers should have a systematic skin inspection once a week.	35	15.3
b. The skin of patients seated in a chair, who cannot move themselves, should be inspected every two to three hours	132	57.9
c. The heels of patients who lie on a pressure redistributing surface should be observed minimum once a day ✓	35	15.4
d. I don't know	26	11.4

The correct answers are indicated in bold

According to K7 on the 'knowledge on classification and observation theme, (n=69) 30.3% of respondents were able to choose the correct description of a grade 3 pressure ulcer. However, 25% (n=57) and 22.8% (n=52) of respondents selected incorrect answers and 21.9% (n=50) indicated that they did not know the answer. Based on this question, less than a third of respondents could classify pressure ulcers.

On the next question (K8), respondents failed to differentiate between stages of pressure ulcers as 42.5% (n=97), answered incorrectly, that all grades (1, 2, 3, and 4) of pressure ulcers involve loss of skin layers. However, a grade 1 pressure ulcer does not involve skin loss but appears like non-blanchable skin. Only (n=69) 36.3% answered correctly, that when necrosis occurs, it is a grade 3 or a grade 4 pressure ulcers. On the next question (K9), 145 (63.6%) respondents knew that friction or shear may occur when moving a patient in bed. Only 59.2% (n=135) answered the next question (K10), correctly that in a sitting position, pressure ulcers are most likely to develop on the pelvic area, elbow and heel.

Only (n=35) 15.4% knew that the heels of patients who lie on a pressure redistributing surface should be observed for a minimum of once a day (K11). The highest percentage 57.9% (n=132) answered incorrectly that the skin of patients seated in a chair, who cannot move themselves, should be inspected every two to three hours instead of hourly which is correct. In this, nurses portrayed their knowledge deficit on the knowledge on classification and observation of pressure ulcers, only (n=89) 39% had knowledge. Similar results were found in Iranian critical care nurses, where the four items of pressure ulcer stage description and definitions were answered correctly by only 55.75% (Iranmanesh *et al.*, 2011:461).

In theme 3, respondents were assessed on their knowledge of risk assessment.

Table 4-4: Frequencies and percentage of responses on knowledge of risk assessments

	Frequency (n)	Percent (%)
K12 Risk assessment		
Which statement is correct?		
a. Risk assessment tool identify all high-risk patients in need of prevention	105	46.0
b. The use of risk assessment scales reduces the cost of prevention.	16	7.0
c. A risk assessment scale may not accurately predict the risk of developing a pressure ulcer and should be combined with clinical judgement	90	39.5
d. I don't know	17	7.5
k13 Risk assessment		
Which statement is correct?		
a. The risk of pressure ulcer development should be assessed daily in all in-patients	90	39.4

	Frequency (n)	Percent (%)
b Absorbing pads should be placed under the patient to minimise the risk of pressure ulcer development	60	26.3
c A patient with a history of pressure ulcers has a higher risk of developing pressure ulcers✓	74	32.5
d I don't know	4	1.8

The correct answers are indicated in bold

In Table 4-4, indicating the results for theme 3, knowledge on risk assessment, only (n=90) 39.4% answered correctly that a risk assessment scale alone may not accurately predict the risk of developing a pressure ulcer and should be combined with clinical judgement. On the same question (K12), 46.0% (n=105) answered incorrectly, that a risk assessment tool can be used to identify all high-risk patients in need of prevention. Only 32.5% (n=74) of respondents knew that a patient with a history of pressure ulcers has a higher risk of developing new pressure ulcers, while 39.4% (n=90) stated that the risk of pressure ulcer development should be assessed daily in all in-patients. However, not all in-patients are at risk of pressure ulcer development. On the risk assessment theme, the respondents also portrayed insufficient knowledge, and only 36% (n=82) answered the two questions of this theme correctly.

The respondents were also assessed on their knowledge of nutrition as a component of pressure ulcers prevention (theme 4). A total of 75.9% (n=173) answered correctly that optimising nutrition can improve the patients' general physical condition, which may contribute to a reduction in the risk of pressure ulcers. Only twelve (5.3%) respondents indicated that they did not know the effects of nutrition on pressure ulcer prevention. This indicates that most respondents had knowledge about the role of nutrition in PUP.

In theme 5, respondents were assessed on their knowledge regarding the reduction of the magnitude of pressure and shearing in the prevention of pressure ulcers. The frequency and percentage responses on the reduction of the magnitude of pressure and shearing are displayed in table 4-5.

Table 4-5: Frequencies and percentage of respondents on their knowledge of the reduction of the magnitude of pressure and shearing

	Frequency (n)	Percent (%)
K15 Prevention		
The sitting position with the lowest contact pressure between the body and the seat is:		
a. An upright sitting position, with both feet resting on a footrest	89	39.1
b. An upright sitting position, with both feet resting on the floor	37	16.2
c. A backwards sitting position, with both legs resting on a footrest	71	31.1
d. I don't know	31	13.6
K16 Prevention		
Which repositioning scheme reduces pressure ulcer risk the most?		
a. Supine position - side 90° lateral position – supine position - 90° lateral positions – supine position.	41	18
b. Supine position – side 30° lateral position – side 30° lateral position – supine position	66	28.9
c. Supine position – side 30° lateral position – sitting position - 30° lateral position – supine position	64	28.1
d. I don't know	57	25
K17 Prevention		
Which statement is correct?		
a. A patient who is able to change positions while sitting should be taught to shift their weight minimum every 60 minutes while sitting in a chair	120	52.6
b. In a side-lying position, the patient should be at a 90° angle with the bed	14	6.1
c. Shearing forces affect a patient's sacrum maximally when the head of the bed is positioned at a 30°	47	20.6
d. I don't know	47	20.6
K18 Prevention		
If a patient is sliding down in a chair, the magnitude of pressure at the seat can be reduced the most by:		
a. A thick air cushion	84	36.8
b. A doughnut-shaped foam cushion	80	35.1

	Frequency (n)	Percent (%)
c. A gel cushion	37	16.2
d. I don't know	27	11.8
K19 Prevention		
For a patient at risk of developing a pressure ulcer, a viscoelastic foam mattress...		
a. Reduces the pressure sufficiently and does not need to be combined with repositioning	24	10.5
b. Has to be combined with repositioning every 2 hours	139	61
c. Has to be combined with repositioning every 4 hours ✓	47	20.6
d. I don't know	18	7.9
K20 Prevention		
A disadvantage of a water mattress is:		
a. Shear at the buttocks increases	50	21.9
b. The pressure at the heels increases	40	17.5
c. Spontaneous small body movements are reduced ✓	83	36.4
d. I don't know	55	24.1
K21 Prevention		
When a patient is lying on a pressure reducing foam mattress...		
a. Elevation of the heels is not necessary	23	10.1
b. Elevation of the heels is important ✓	91	39.9
c. He or she should be checked for "bottoming out" at least twice a day.	70	30.7
d. I don't know	44	19.3
The correct answers are in bold		

Only (n=71) 31.1% of respondents answered correctly that the sitting position with the lowest contact pressure between the body and the seat is a backwards sitting position, with both legs resting on a footrest (K15). Some 39% (n=89) answered incorrectly, that an upright sitting position, with both feet resting on a footrest, is the proper position.

On the repositioning scheme that reduces pressure ulcer risks (K16), only 28,9% (n=66), of respondents answered correctly that supine position – side 30° lateral position – side 30° lateral position – supine position is the ideal protocol. A study done in Sweden showed that only 26.5% of registered nurses correctly answered this question (Gunningberg *et al.*, 2015:4). On the same question, only 43% (n=91) answered it incorrectly. A total of 25% (n=57) of respondents indicated that they did not know the positioning schemes that reduce pressure ulcers. This high

percentage indicates a significant knowledge deficit about positioning schemes among respondents in this survey.

In this study, only (n=120) 52,6% of respondents answered correctly that patients' who are able to change positions while sitting, should be taught to shift their weight at least every 60 minutes while sitting on a chair (K17). Some 20.6% (n=47) answered incorrectly that shearing forces affect a patient's sacrum maximally when the head of the bed is positioned at 30°. Equally so, (n=47) 20.6% of respondents selected; "I don't know" as their answer.

Altogether 36.8% (n=84) correctly indicated that if a patient is sliding down in a chair, the magnitude of pressure at the seat can be reduced by a thick air cushion (K18). Most respondents selected the option of doughnut-shaped cushions at 35.1% (n=80), which is not recommended as it promotes the development of pressure ulcers. The knowledge deficit was also found in a study in Sweden where only 25.5% of registered nurses correctly answered that pressure in a chair seat can best be reduced by the use of a thick air cushion (Gunningberg *et.al.*, 2015:4).

Respondents' knowledge on the most suitable mattresses was minimal with only (n=47) 20.6% who knew that a patient on a viscoelastic foam mattress should be repositioned every four hours (K19). Only (n=83) 36.4% of respondents knew the disadvantage of water mattresses is that spontaneous small body movements are reduced (K20).

A total of ninety-one (39.9%) of respondents correctly answered that elevation of the heels is important when a patient is lying on a pressure reducing foam mattress (K21). The other respondents answered the question incorrectly. Theme 5 also indicated a knowledge deficit among respondents as (n=80) 35.1% nurses answered this theme correctly.

In theme 6, the respondents were assessed on their knowledge of preventive measures to reduce the duration of pressure or shear.

Table 4-6: Frequencies and percentage of responses on knowledge of measures to reduce the duration of pressure/shear

	Frequency (n)	Percent (%)
K22 Prevention		
Repositioning is an accurate preventive method because...		
a. The magnitude of pressure and shear will be reduced	40	17.5
b. The amount and the duration of pressure and shear will be	99	43.4

	Frequency (n)	Percent (%)
reduced		
c. The duration of pressure and shear will be reduced √	63	27.6
d. I don't know	26	11.4
K23 Prevention		
Fewer patients will develop a pressure ulcer if...		
a. Foods supplements are provided.	18	7.9
b. The areas at risk are massaged.	84	36.8
c. Patients are mobilized √	114	50
d. I don't know.	12	5.3
K24 Prevention		
Which statement is correct?		
a. Patients at risk lying on a non-pressure reducing foam mattress should be repositioned every 2 hours. √	121	53.1
b. Patients at risk lying on an alternating air mattress should be repositioned every 4 hours	32	14
c. Patients at risk lying on a viscoelastic foam mattress should be repositioned every 2 hours	39	17.1
d. I don't know	36	15.8
K25 Prevention		
When a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcer includes:		
a. No specific preventive measures	16	7
b. A pressure reducing cushion under the heels	120	52.6
c. A cushion under the lower legs elevating the heels √	67	29.4
d. I don't know	25	11
K26 Prevention		
If a bedridden patient cannot be repositioned, the most appropriate pressure ulcer prevention is:		
a. A pressure redistributing foam mattress	81	35.5
b. An alternating pressure air mattress √	85	37.3
c. Local treatment of the risk areas with zinc oxide paste	31	13.6
d. I don't know	31	13.6
The correct answers are in bold		

The above Table 4-6 indicates that in theme 6; preventive measures to reduce the duration of pressure and shear yielded results which indicate insufficient knowledge. Only 27% (n=63) knew that repositioning is an accurate preventive method that reduces the duration of pressure and shear (K22). A total of 43.4% (n=99) answered incorrectly that with repositioning, the amount and the duration of pressure and shear will be reduced.

On K23 of theme 6, (n=144) 50%, which is half of the respondents, understood that mobilising a patient can reduce the development of pressure ulcers. Some 36.8% (n=84) still massage the pressure ulcer area, although the practice is not recommended as it promotes the development of pressure ulcers (Panagiotopoulou & Kerr, 2002:291). More than half of the respondents 53.1% (n=121) knew that patients who are at risk and lying on a non-pressure reducing foam mattress should be repositioned every 2 hours (K24). A total of 29.4% (n=67) knew that when a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcer includes a cushion under the lower legs to elevate the heels (K25). Altogether 52.6% (n=120) which accounted for more than half of respondents, did not know the right technique of heel elevation. Among the respondents, 37.3% (n=85) answered correctly that alternating pressure air mattress is ideal for a bedridden patient (K26). The respondents who answered this theme correctly were (n=90) 39.5%.

The results indicated severe knowledge deficit on pressure ulcer prevention among the nurses as less than half of nurses' 46.1% (n=105) had knowledge of PUP. This study demonstrated nurses' knowledge deficit in all six main sections; aetiology and development 52%, classification and observation 39%, risk assessment 36%, nutrition 75,9%, reduction of the magnitude pressure and shearing 35,1%, and reduction of the duration of pressure and shearing 39,5%. The overall knowledge of pressure ulcers was unacceptable, and there can be concluded that there is a knowledge deficit among respondents in this study, as indicated by the low percentage of correct answers. The study that was done in Sweden in 2013, also found a knowledge deficit among nurses at 59.3% (Gunningberg *et al.*, 2015:5).

4.6 Comparison of the respondents' knowledge of pressure ulcers prevention

The T-test and ANOVA tests were used to compare the respondents' knowledge about PUP.

4.6.1 The T-test

The T-test was used in this study to compare two groups, such as gender and hospitals. In this study, the focus was on effect size. The effect size ranges are: 0.2, which equates to a small effect, 0.5 to less than 0.8 which equates to a medium effect, and effects larger than 0.8 equate to large effects (Schuele & Justice, 2016:26). Table 4-7 below indicates whether gender has an

impact on the knowledge of pressure ulcers prevention. The P-value is not relevant in this study because it is not a random sample, it was reported.

Table 4-7: Impact of gender on knowledge of pressure ulcers prevention

Item	Sex	n	Mean	p-value	Effect size
K13 Risk assessment	M	62	0,19	0,005	0,37
	F	166	0,37		

Females had more knowledge about risk assessment (K13) than male respondents, although their knowledge is also not good, 37% against 19%. The effect size is 0.37, which is a medium effect. It is significant. The difference between the knowledge of females and males regarding PU prevention is 18%. Risk assessment (K13) has a p-value of 0.005, which is statistically significant.

Gender was the only variable that had more than a low effect and is therefore the only one which is reported. On aetiology and development (K2, K5, K6), classification and development (K7 to K11), risk assessment (K12 to K13), nutrition (K14), reduction of the magnitude of pressure/shear (K15 to K21) and reduction of the duration of pressure/shear (K22, K23, K25), the results of knowledge on PUP among respondents from different wards were non-significant, therefore they were not reported.

The T-test was also used to compare the two hospitals, but there were no important differences between the hospitals, all the effect sizes were small; therefore, the results were not reported.

4.6.2 The ANOVA test

In this study, the Analysis of Variance (ANOVA) test was used to compare more than two groups for example, different wards. All the wards were compared to the one whose respondents obtained the highest mean score. The effect size of one question which was significant in each section is discussed. Operating theatre in K1, oncology ward in K3, wound care unit K4, Spinalis unit K24 and Intensive care unit K26 will be discussed.

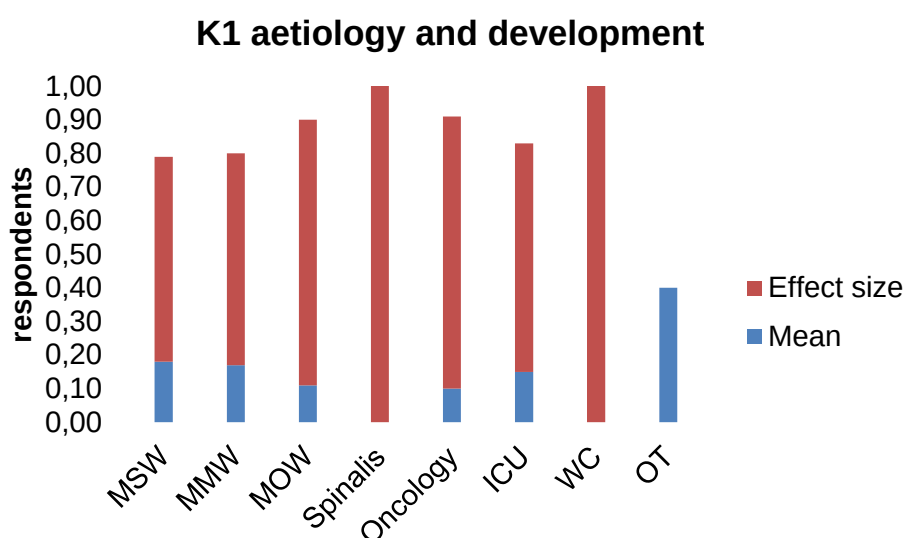


Figure 4-7: Effect size of knowledge of respondents working in different units, compared to those working in the operation theatre

The respondents from the operating theatre (OT) had more knowledge than those from other wards on K1 regarding knowledge of aetiology and development of PU at 40%. The respondents from the Spinalis unit and wound care unit scored the lowest at 0% with a large effect size at 1.08. This is concerning that these respondents had severe knowledge deficit on the K1 aetiology and development question. The Spinalis unit admits patients with spinal cord injuries after road traffic accidents, and these patients are at high risk of developing PU since they are confirmed to bedrest and has loss of sensation. A severe knowledge deficit indicated by respondents working in the Spinalis unit in this study predisposes patients to PU as there is a probability of nurses not carrying out preventative measures and risk assessment due to insufficient knowledge.

The male surgical ward (MSW) and male medical ward (MMW) had a medium effect size. The male orthopaedic ward (MOW) had a large effect size of 0.79 compared to the respondents in the OT, and this is practically significant of severe knowledge deficit which can contribute to nurses not providing optimal PUP.

The oncology ward had a large effect size of 0.81 with OT, which is also practically significant and shows a knowledge deficit among the respondents. The Intensive care unit (ICU) had a medium effect size of 0.68, which is significant. Significantly, ICU nurses in this study had a lack of knowledge on PUP as these nurses must be knowledgeable about PUP as most of the patients admitted in this unit are critically ill patients who are bed-ridden who cannot report discomfort and are maybe on mechanical ventilators ((Hitzig *et al.*, 2013:600; Strand & Lindgren, 2010:336; Gage, 2015:53; Cooper, 2013:60). This indicates that there is a probability

of insufficient knowledge towards PU prevention among respondents from these wards. The results of concern are that patients will have a high chance of not receiving appropriate preventative measures.

Figure 4-8 illustrates the effect size of respondents from different wards with the oncology ward in knowledge on aetiology and development question which states that shearing increases when the skin sticks to the surface (K3).

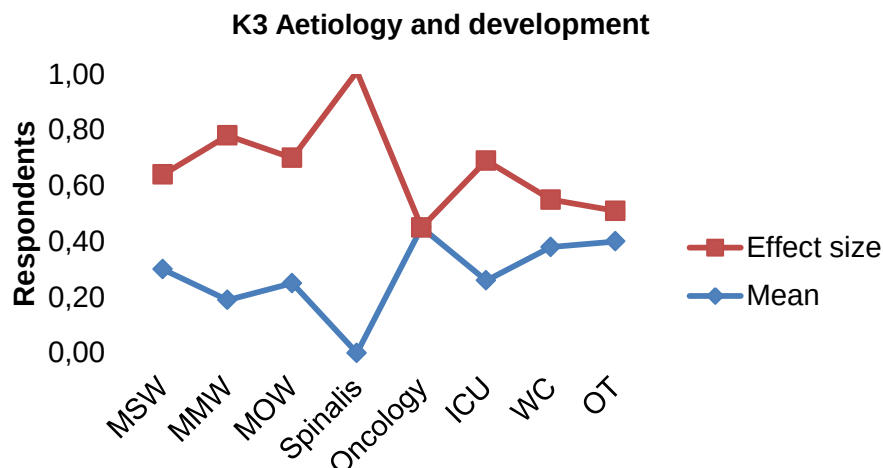


Figure 4-8: Effect size of knowledge of respondents working in different wards compared to those working in the oncology ward

In accordance with Figure 4-8, the oncology ward respondents had the most knowledge on K3 aetiology and development, shearing increases when the skin sticks to the surface at 45% while respondents from the Spinalis unit scored the least at 0%. Therefore, the Spinalis unit respondents had a knowledge deficit in this question shearing increases when the skin sticks to the surface. The male surgical ward, male medical ward, male orthopaedic ward and Intensive care unit respondents had a medium effect size compared to the oncology ward. The results indicate that the knowledge deficiency among the respondents in these wards is significant. In this study, the wound care (WC) unit and operating theatre (OT) had small effect sizes, which is non-significant. The results indicate that WC and OT respondents had better knowledge on K3 aetiology than the male surgical ward, male medical ward, male orthopaedic ward, and Intensive care unit respondents.

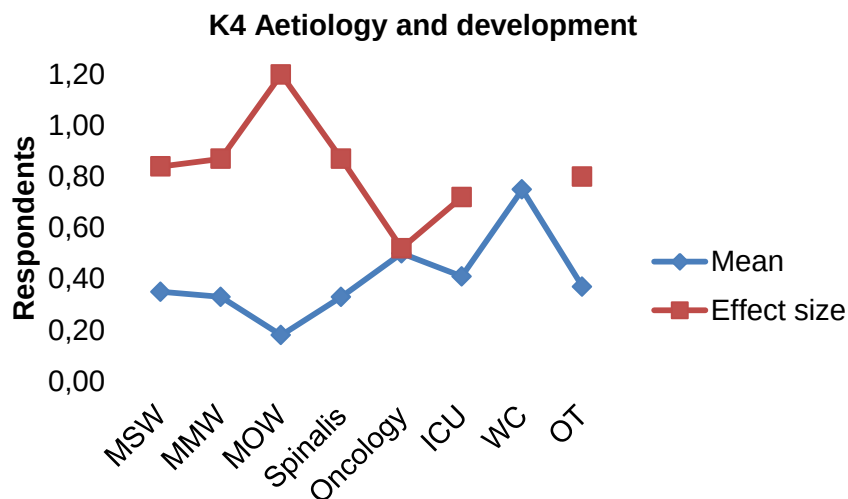


Figure 4-9: Effect size of knowledge of respondents working in different wards compared to those working in the wound care unit

Respondents from the wound care unit portrayed more knowledge on the K4 aetiology and development question, which indicated that shear, is the force which occurs when the body slides and the skin sticks to the surface at 75%, while the male orthopaedic ward respondents had a knowledge deficit at 18%. The difference between the wound care unit and male orthopaedic ward respondents was 57%. The male surgical ward, male medical ward, male orthopaedic ward and operating theatre had a large effect size. This is practically significant, which indicates that respondents had a knowledge deficit on this question compared to the wound care unit.

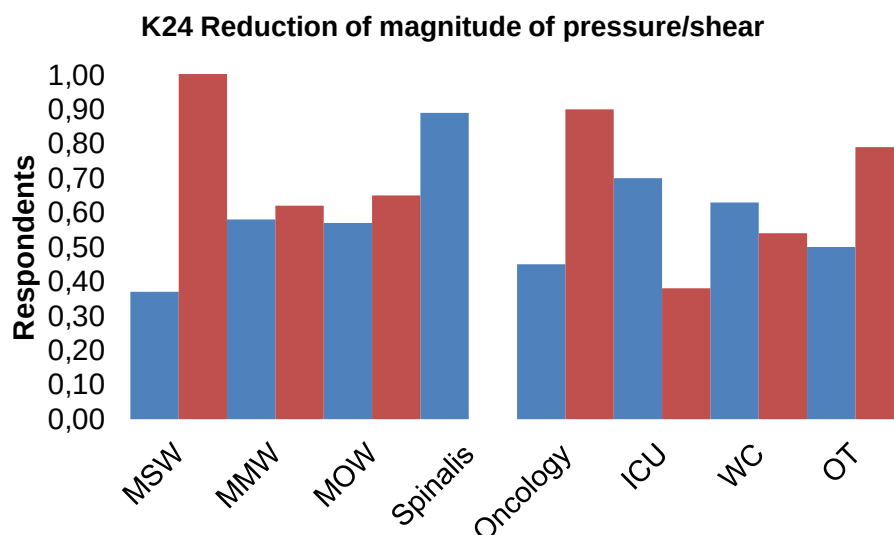


Figure 4-10: Effect size of knowledge of respondents working in different units compared to those working in the Spinalis unit

Respondents working in the Spinalis unit had more knowledge on K24 question on the knowledge on reduction of the magnitude of pressure and shear, which was about patients at risk lying on a non-pressure reducing foam mattress, should be repositioned every 2 hours at 89%, Nurses working in the male surgical ward scored 37% as the lowest score. The difference between the highest mark (Spinalis unit) and the lowest mark (male surgical ward) was 52%. The male surgical ward had a large effect size of 1.06, the effect size is practically significant in that the nurses working in the male surgical ward displayed unsatisfactory results (knowledge deficit) on the K24 question. The effect size for male medical ward, male orthopaedic ward, intensive care unit, and wound care unit was medium, and it is significant. The results of the respondents working in the oncology ward had a high effect size of 0.9, which is practically significant and indicates that respondents had a knowledge deficit in this question.

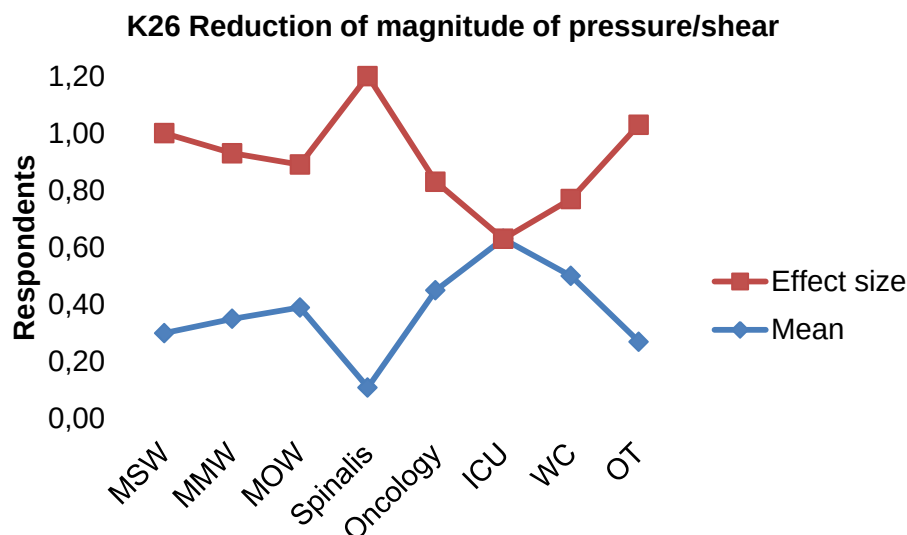


Figure 4-11: Effect size of knowledge of respondents working in different wards compared to those in ICU

Intensive care unit respondents had more knowledge on the question of a bed-ridden patient who cannot be repositioned; the most appropriate pressure ulcer prevention is an alternating pressure air mattress (K26), which was on the reduction of the magnitude of pressure and shear. The Spinalis unit respondents scored the least at 11% who answered correctly, with a large effect size of 1.09, which is practically significant and means that respondents from the Spinalis unit had a severe knowledge deficit on this question.

In a study by Athlin *et al.* (2009:2255), they described knowledge as an essential factor to prevent pressure ulcers. Their study further showed inadequate knowledge, lack of knowledge and out-of-date knowledge among nurses about how to prevent pressure ulcers. A study by Buss *et al.* (2004:674), found that nurses do not consider pressure ulcers' prevention as a

critical component of their daily work of nurses due to their lack of knowledge of the issue. In this study, the evidence indicates that a lack of knowledge of pressure ulcers' prevention is visible among both genders and respondents from both hospitals and different wards. Nurses working in the Spinalis unit have very poor knowledge although it is very important in the nursing care they provide.

4.7 Attitude assessment towards pressure ulcers prevention

The validated Attitude toward Pressure Ulcer instrument (APuP) was used to study the attitudes of the nurses toward pressure ulcer prevention (Beeckman *et al.*, 2010a:1437). The instrument includes 11 items and reflects five subscale domains: (1) personal competency to prevent pressure ulcers, (2) priority of pressure ulcer prevention, (3) impact of pressure ulcers, (4) responsibility in pressure ulcer prevention, and (5) confidence in the effectiveness of prevention. A 4-point Likert-type scale was used to collect the data (1= strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree). The results of nurses' attitude towards PUP are displayed in Figure 4-12.

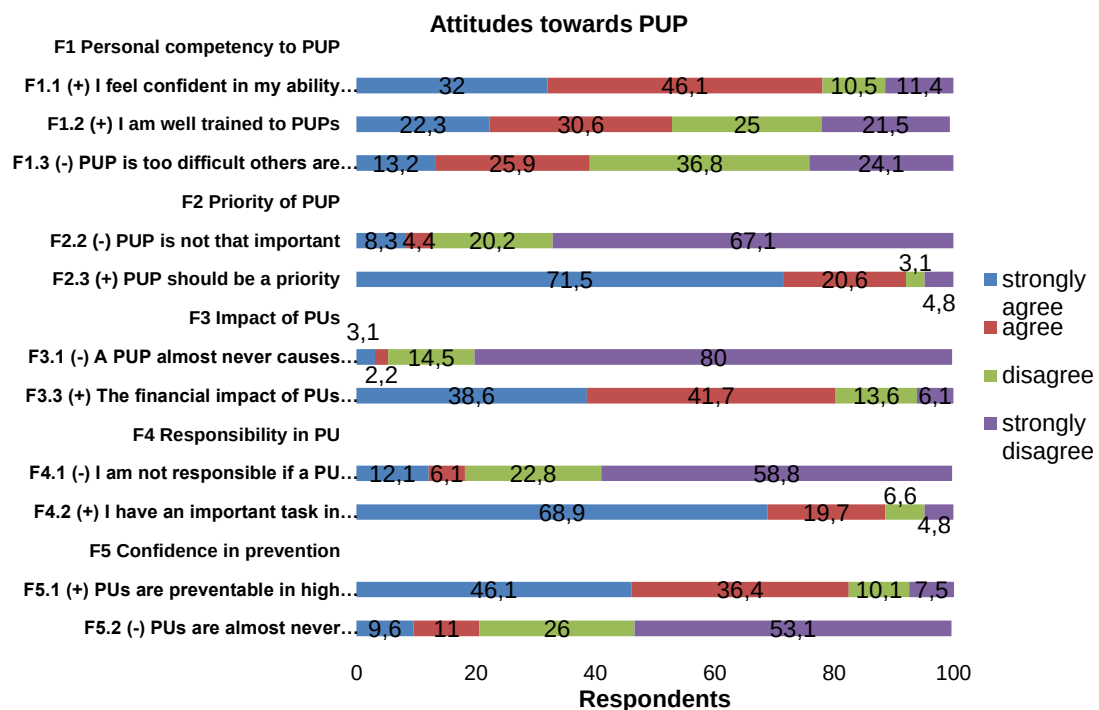


Figure 4-12: Percentage of attitude displayed towards pressure ulcers prevention

The results in Figure 4-12 indicate that, concerning personal competency, only 32% (n=73) of respondents had confidence in pressure ulcer prevention. In a study by Athlin *et al.* (2009:2255), competency among healthcare personnel was described as an important factor to prevent pressure ulcers. In the current study, 23.2% (n=53) of respondents had a positive

attitude regarding their training on pressure ulcers since they felt they are well trained on pressure ulcers.

The attitude of nurses was also assessed regarding the priority of pressure ulcers' prevention, as shown in Figure 4-12. A total of 71.5% (n=163) of respondents had a positive attitude towards pressure ulcers as a priority. Pressure ulcers' prevention should be a priority for nurses (Gunningberg *et al.*, 2001:257; Moore & Price, 2004:946) as there is a better chance that preventative measures will be implemented if PUP is seen as a priority compared to not being considered a priority.

Respondents were also assessed on their attitude on the impact of pressure ulcers. Only (n=88) 38.6% of the respondents had a positive attitude on the impact of pressure ulcers because they stated that the financial impact of pressure ulcers on society is high. Evidence concerning the strong impact of pressure ulcers on patients and society is provided by multiple researchers (Hopkins *et al.*, 2006:345; Essex *et al.*, 2009:797; Lardenoye *et al.*, 2009:1797; Gorecki *et al.*, 2009:1177). If pressure ulcers are considered as having a low impact, preventative measures will not be carried out correctly.

The responsibility of nurses in pressure ulcer prevention was also assessed among the respondents. Figure 4-12 illustrates that (n=157) 68.9% of the respondents had a positive attitude to their responsibility for pressure ulcer prevention as they indicate that they have an important task in pressure ulcer prevention. The nurses' responsibility was stressed as an essential factor in pressure ulcer preventive care by Athlin *et al.* (2009:2254). Some 12.3% (n=28) of the respondents indicated that they are not responsible if a pressure ulcer develops in patients, which indicates a negative attitude. According to Athlin *et al.* (2009:2254), nurses have the main responsibility for PU prevention and risk assessment.

Nurses were also assessed on their confidence in the effectiveness of prevention. The study shows that 46.1% (n=105) of respondents had a positive attitude and confidence in the effectiveness of pressure ulcer prevention. They indicated that pressure ulcers are preventable in high-risk patients. However, a total of 9.6% (n=22) had a negative attitude as they indicated that pressure ulcers are almost never preventable.

The respondents' mean score, as indicated in Table 4-1 as it relates to nurses' attitude about personal competence, is high at 2.2471, which indicates a positive attitude. Nurses' attitude about responsibility has a low score of 1.5965, which indicates that respondents had a negative attitude towards PUP on this variable.

In this study, the overall attitude for respondents towards PUP was negative as some 8.3% of nurses indicated that PUP is not important and that it is not their responsibility if a patient develops pressure ulcers by 12,3% (n=28). The overall attitude for nurses towards PUP was negative.

4.8 Barriers to pressure ulcers prevention

In the last section of the survey instrument, the respondents were asked to indicate the barriers that hinder PUP. The respondents had to answer with 'Yes' or 'No'. In question 12, the respondents had to specify any barriers that they encounter in their practice that are not indicated in the questionnaire. In this study, respondents indicated that heavy workload, lack of adequate staffing, shortage of equipment and inadequate knowledge about pressure ulcers were significant barriers to pressure ulcer prevention. A study at Mulago Teaching Hospital in Uganda cited the same barriers (Mwebeza *et al.*, 2014:4). This study also indicated the barriers which were experienced in other countries. The summary of barriers experienced is displayed in Figure 4-13.

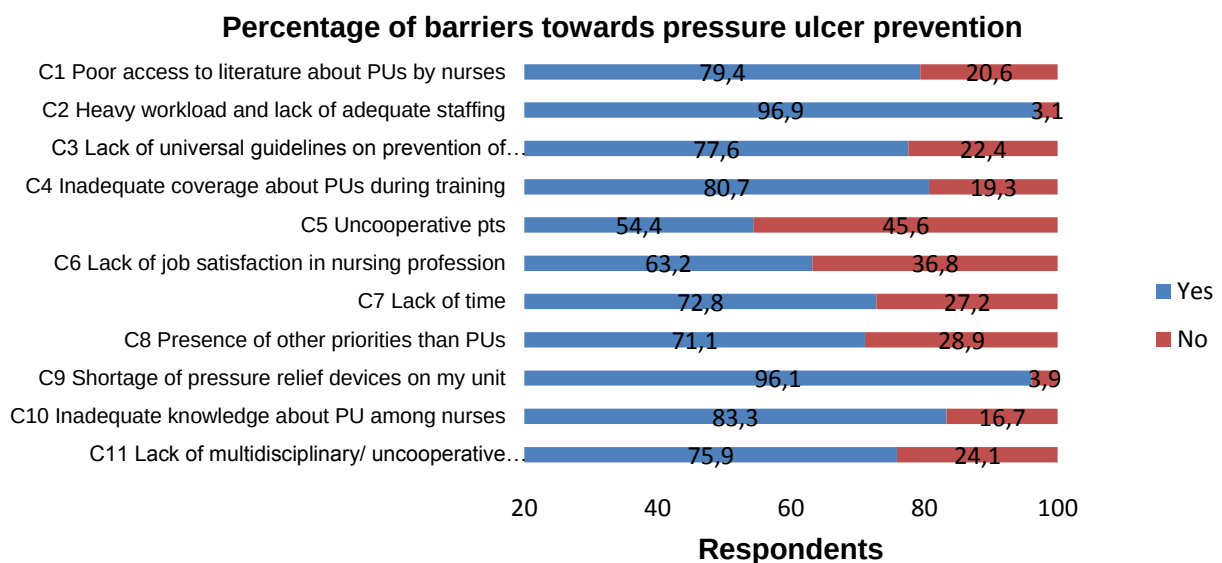


Figure 4-13: Percentage distribution of barriers that hinder pressure ulcer prevention

Figure 4-13 illustrates that a heavy workload and lack of adequate staffing (C2) are the barriers that were perceived to be the most prominent, as (n=221) 96.9% of respondents perceived it as a barrier to PUP. Most respondents identified a shortage of pressure-relieving devices in the unit or equipment (C9) used for pressure ulcer care, as the second-largest barrier, as 96.1% (n=219) of respondents selected 'Yes' to the statement. The other cited barriers were inadequate knowledge about pressure ulcers among nurses (C10) at 83.3% (n=190) and

inadequate coverage about pressure ulcers during training (C4), which was selected by 80.7% (n=184) of the respondents.

In this study, (n=181) 79.4% of the respondents reported poor access to literature about pressure ulcers (C1). Lack of universal guidelines on prevention of pressure ulcers was cited by (n=177) 77.6% of the respondents. In question C13, 80,7% (n=184) of respondents indicated that they do not have challenges in pressure ulcer prevention (C13). Lack of time (C7) was selected by 72,8% (n=166). Some respondents (n=162) 71,1%, indicated that there are other priorities than pressure ulcers (C8). If low priority is given to the prevention of pressure ulcers, nurses will fail to provide PU preventative measures effectively.

The neglect to consider pressure ulcers' prevention as a priority in care was also found in research by Gunningberg *et al.* (2001:257) and Moore and Price (2004:946). These authors stated that a most of the nurses in their studies consider pressure ulcer prevention as being of low priority in their daily work.

In this study, on the barrier section where nurses were asked to specify the barriers; 63.2% of respondents indicated a lack of job satisfaction in the nursing profession as one of the barriers. Altogether 54.6% of the respondents identified uncooperative patients as a barrier. In the open-ended question where respondents could indicate other barriers to PUP the following were identified; nurse-patient ratio, poor education, lack of knowledge among staff, patients, relatives, negligence by nurses, laziness, workload, critically ill patients and lack of equipment.

A study by Athlin *et al.* (2009:2256) also identified a lack of personnel and time as a severe obstacle in the care of PU, especially during evenings and weekends, both in hospitals and community care.

4.9 Factor analysis

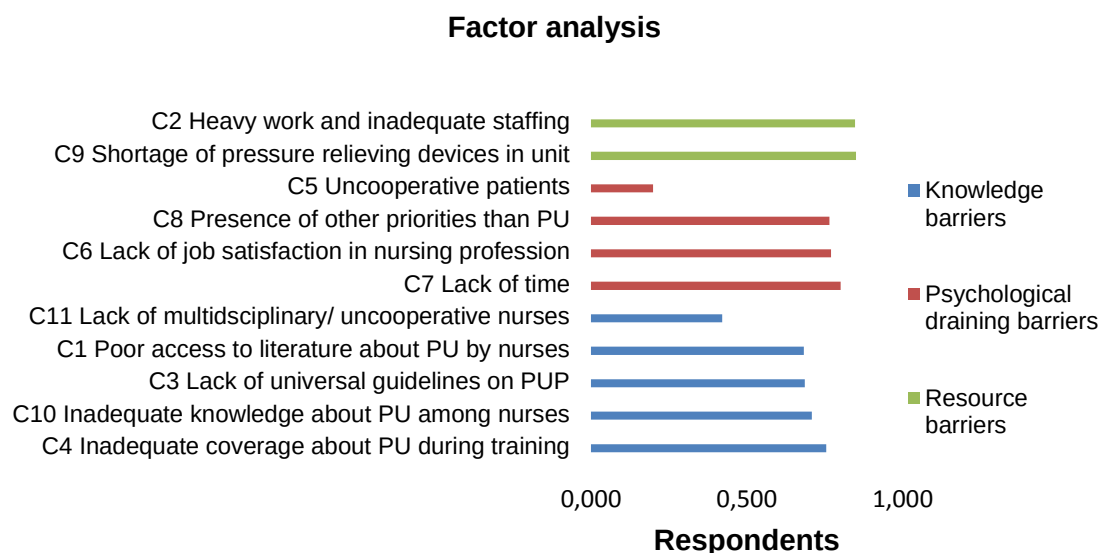
The principal component exploratory factor analysis was used to classify the barriers questions. The data was classified to transform a large set of variables into a smaller one that still contains most of the information in the large set. The percentage variance is explained in table 4-8.

Table 4-8: Total Variance Explained

						Rotation Sums of Squared Loadings ^a
Initial Eigenvalues			Extraction Sums of Squared Loadings			
Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
2,858	25,978	25,978	2,858	25,978	25,978	2,415
1,551	14,102	40,079	1,551	14,102	40,079	2,150
1,249	11,351	51,431	1,249	11,351	51,431	1,677

The factor analysis is explained in the pattern matrix Table 4-8. The total variance for three factors extracted explained was 51,431%.

The Kaiser Meyer Olkin (KMO) of sampling adequacy was 0.707. The KMO was good enough to get factor analysis. The classifications of barriers were identified as (1) knowledge barriers, (2) psychological draining barriers and (3) resource barriers, as indicated in Figure 4-14.

**Figure 4-14: Illustration of principal component analysis**

- Knowledge barriers**

On the pattern principal component analysis figure, knowledge barriers are measured by the following items: inadequate coverage of pressure ulcers prevention during training, inadequate knowledge about pressure ulcers among nurses, lack of universal guidelines on prevention of pressure ulcers and poor access to literature about pressure ulcers by nurses.

- **Psychological draining barriers**

The factor analysis indicated the psychological barriers as a lack of multidisciplinary and uncooperative work among registered nurses, lack of time, lack of job satisfaction in the nursing profession, presence of other priorities than pressure ulcers and uncooperative patients.

- **Resource barriers**

According to the factor analysis, the shortage of pressure-relieving devices on the unit or equipment used for pressure ulcer care, heavy workload and lack of adequate staffing (human resources) were classified as resource barriers. The barriers' mean score results are presented in Figure 4-15.

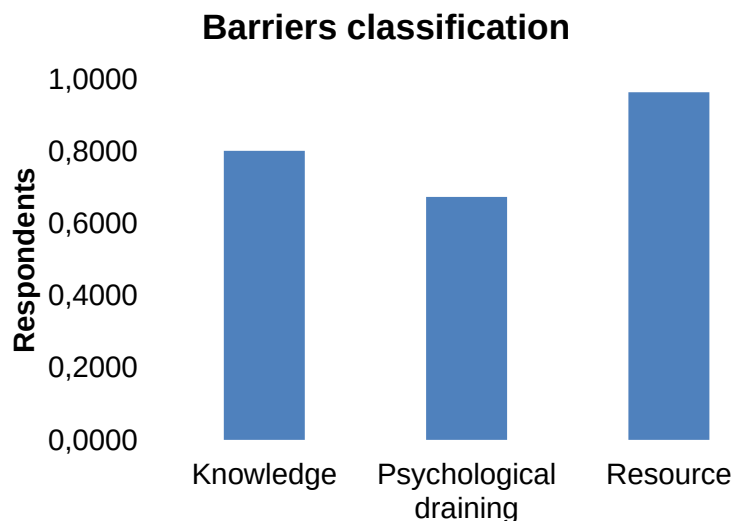


Figure 4-15: Mean score of barriers that hinder pressure ulcer prevention

The largest factor of barriers was the resource barriers at 96.5%, followed by the knowledge-barriers at 80% and then the psychological draining barriers at 67%. The resource barriers were the most prominent one towards PUP.

The barriers identified by respondents were also compared. There was no difference between psychological drain barriers and barriers knowledge, and those results are not reported.

The responses related to the various classifications of barriers according to the nurses working in different wards were compared with the ANOVA test.

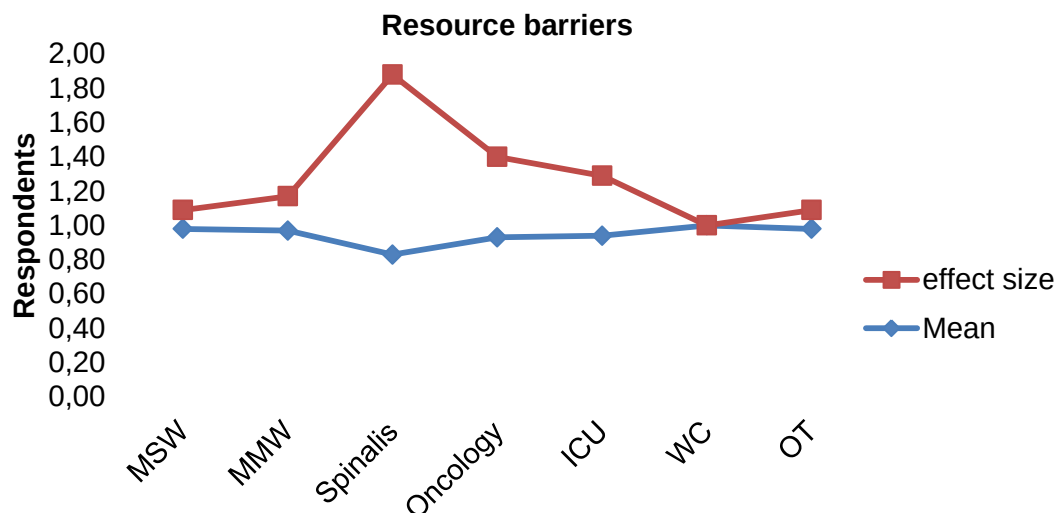


Figure 4-16: Effect size of barriers classification of respondents working in different wards with those in wound care

Figure 4-16 indicates that respondents from all the wards experienced resource barriers, and responses from being compared to the responses of respondents from the wound care unit who indicated resources barriers as their most significant barrier. The responses from the male surgical ward and male orthopaedic ward had a small effect size compared to the wound care unit and the effect size is non-significant. The effects size for the male medical ward, Intensive care unit and oncology ward compared to the wound care unit was medium and is significant. The Spinalis unit had a large effect size of 1.05 compared to the wound care unit and it is practically significant that respondents from the Spinalis unit experienced fewer resource barriers than the respondents from the wound care unit.

4.10 Non-parametric correlations

The statistical evaluation was used to study the strength of a relationship between variables, for example, correlation of knowledge with age, education, and years of experience, attitude and barriers. Only variables with significant relationships are reported on as strong, weak or significant.

Age and knowledge of nutrition as a factor contributing to PU had a weak positive correlation of 0.161. The older the respondents were, the more they knew about the importance of nutrition in pressure ulcers' prevention. A low negative correlation of -0.137 was found between age and knowledge of reduction of the duration of pressure or shear K25. The older the participants, the less they had knowledge on the factor that when a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcer includes a cushion under the lower legs elevating the heels (K25).

The relationship was also checked between knowledge of PUP and education. A low negative correlation of -0.143 was found between education and the question, K12 on risk assessment. The more the respondents were educated, the less they knew about risk assessment (K12). A weak positive correlation of 0.135 is seen between education and knowledge of reduction of the duration of pressure/shear (K23). The more the nurses were educated, the more they knew about the fact that fewer patients will develop a pressure ulcer if patients are mobilised.

There was a significant positive relationship between knowledge of PUP and years of experience. A weak positive correlation of 0.155 was identified on the years of experience and the question K1 of aetiology and development. The more the years of experience the respondents had, the more they knew about lack of oxygen causing pressure ulcers (K1). There was a weak positive correlation of 0.144 on years of experience and question K11 on the knowledge of classification and observation pressure ulcers. The more years of experience the respondents had, the more they were able to stage pressure ulcers. Likewise, there was a weak positive correlation of 0.174 between experience and the importance of nutrition in PUP (K14). Respondents with more years of experience portrayed more knowledge on the importance of nutrition.

The scores on attitude were also compared with the other variables. A negative correlation indicates that the attitude of nurses towards the prevention of pressure ulcers has a negative effect on the prevention of pressure ulcers while a positive correlation will have a positive attitude towards prevention. The overall attitude and knowledge of aetiology and development theme, on the question that the contact area involved is small and, thus, the amount of pressure is higher (K2) indicated a weak negative correlation of -0.143.

Likewise, a low negative correlation of -0.154 was also found between the overall attitude and hypertension is not a contributing factor for pressure ulcer risk (K6) of aetiology and development. Furthermore, a low negative correlation of -0.130 is identified between overall attitude and knowledge of classification and observation, which is about friction or shear may occur when moving a patient in bed (K9). There was a weak positive correlation of 0.153 between overall attitude and knowledge on risk assessment, which stated that a patient with a history of pressure ulcers has a higher risk of developing pressure ulcers (K13).

The attitude of responsibility and knowledge aetiology and development question about hypertension is not a contributing factor for pressure ulcer risk (K6) had a low negative correlation of -0.240. A low positive correlation of 0.136 is between overall attitude and reduction of the magnitude of pressure and shearing (K16). A negative low attitude correlation of -0.178 was found on the reduction of the duration of pressure or shear (K24). The attitude

personal competence and reduction of the magnitude of pressure and shearing (K19) had a low negative correlation of -0.131. Moreover, attitude, confidence prevention and the reduction of the duration of pressure and shearing (K24) had a low negative correlation of -0.173. The negative correlation increases the chances of patients to develop pressure ulcers as nurses will see pressure ulcers prevention as less important in their daily work schedules.

Knowledge barriers and classification and observation (K11) had a weak positive correlation of 0.134. Knowledge barriers and risk assessment (K13) had a weak positive correlation of 0.314. A weak positive correlation of 0.175 was found between knowledge barriers and reduction of the magnitude of pressure and shearing (K15). A weak correlation of 0.154 exists between knowledge barriers and nutrition theme (K14). Barriers pertaining to psychology draining and risk assessment (K13) had a weak positive correlation of 0.221. There is a weak positive correlation of 0.154 between barriers pertaining to psychological draining and nutrition (K14). The barriers pertaining to psychological draining and reduction of the magnitude of pressure and shearing (K15) had a positive correlation of 0.186. Barriers like resources and nutrition (K14) had a weak positive correlation of 0.140.

The more the nurses experience barriers to pressure ulcers prevention, the more they fail to prevent pressure ulcers and as a result, patients may develop pressure ulcers. If there are fewer barriers, nurses will be able to prevent pressure ulcers.

4.11 Conclusion

The results of the study indicated that nurses had a knowledge deficit on the major themes of pressure ulcers' prevention, which includes aetiology and development, classification and observation, risk assessment and mechanical load. Most respondents' had knowledge of the importance of good nutrition in the prevention of pressure ulcers. The knowledge of respondents between the two hospitals, gender, and across different wards was compared, but the differences were not large as there was severe knowledge deficit of all the groups. The attitude scale was reliable, and the respondents portrayed a negative attitude towards pressure ulcers' prevention. Most of the respondents felt that they are not responsible for pressure ulcers' development and that prevention of pressure ulcers is not a priority. All the respondents indicated that they experienced barriers in their practice towards prevention of pressure ulcers, with resource barriers being the most significant barrier.

CHAPTER 5: DISCUSSION OF RESULTS

5.1 Introduction

This chapter aims to describe the current situation of pressure ulcers' prevention in two selected referral hospitals in Botswana and to compare results with the empirical literature. The researcher needs to report the study findings in a meaningful manner to evaluate the importance and relevance of it (Schuele & Justice, 2006:14). Data analysis was run on SPSS Version 25. Descriptive and inferential statistics were prepared. When comparing the results of two groups, t-tests were used and when comparing results across more than two groups, one-way analysis of variance (ANOVA) was employed. The focus is on effect size, 0.5 equates to a medium effect size, and that is statistically significant.

5.2 Discussion

This study aims to describe nurses' knowledge, attitudes and barriers towards pressure ulcers' prevention in two selected referral hospitals in Botswana. The study further explored the correlation between age, education, experience, attitude and barriers and the application of optimal prevention measures. The results showed that the knowledge of nurses about pressure ulcers' prevention in two referral hospitals in Botswana was poor. Moreover, many nurses showed a negative attitude towards pressure ulcers' prevention.

5.2.1 Knowledge of respondents towards pressure ulcers' prevention

In exploring adequate knowledge about pressure ulcers' prevention, it is important to decide: (1) which patients should receive prevention measures, (2) which prevention measures should be applied, and (3) how prevention measures should be applied. This study highlights concerns about nurses' knowledge of pressure ulcers' prevention. The respondents' knowledge about pressure ulcers' prevention is described as correct answers to questions on all the following knowledge items: (1) aetiology and development 52% (n=119), (2) classification and observation 39% (n=89), (3) risk assessment 36% (n=82), (4) nutrition 75,9% (n=173), (5) reduction of the magnitude of pressure and shearing 35,1% (n=80), and (6) reduction of the duration of pressure and shearing 39,5% (n=90). Less than a quarter of the nurses had a desirable level of knowledge.

The knowledge assessment questions instrument was not reliable as a whole, as indicated by the Cronbach's alpha of 0.440, and the sub-sections were also not reliable. The questions were therefore analysed individually.

In this study, the T-test was used to compare the results of the two groups. There was no significant difference between the level of knowledge between the respondents of the two hospitals. Females were more knowledgeable about risk assessment (K13) than male respondents, even though both groups scored low, 37% against 19%. No results were found from other studies which compared the knowledge of gender towards pressure ulcers' prevention.

The ANOVA test was used to compare the knowledge of PUP of respondents from different wards. Respondents working in a unit that scored high were compared with those working in different wards, although the knowledge scores were low across all the wards. The results are similar to those of studies done in Sweden (Gunningberg *et al.*, 2015:4), Iran (Iranmanesh *et al.*, 2011:461; Iranmanesh *et al.*, 2013:3) and Egypt (Taha, 2014:260).

The results (Table 4-2) indicated that only 17.1% (n=39) of nurses were aware that lack of oxygen causes pressure ulcers (K1). This result is similar to the results of the study done in Sweden (Gunningberg *et al.*, 2015:4). In this study, the majority of respondents 61.8% (n=141) selected moisture as a cause of PUs, when, in fact, it is a risk factor. The results show that there is confusion about the difference between a risk factor and a causative factor in PU aetiology and development. When nurses have no explicit knowledge of the cause of pressure ulcers, patients will not receive evidence-based prevention.

On the classification and observation theme, nurses did not know about the stages of pressure ulcers. This could influence nursing practice on prevention of PU, as the prevention of PU progression from stage I to other stages lies in the knowledge of classifying pressure ulcers. According to Akese *et al.* (2014:47), the identification or staging of PU allows for a universal assessment and consistent communication of the severity of tissue damage among healthcare professionals. A reasonable level of knowledge on PU identification is expected from nurses; however, the findings of the study revealed that most of the respondents demonstrated a low level of knowledge 40.8% (n=93). This low level of knowledge on PUP results was also found in Iranian critical care nurses (Iranmanesh *et al.*, 2011:461), and Chianca *et al.* (2010:45) found similar results in Brazil.

The process of PU prevention begins with a risk assessment incorporating the evaluation of identified risk factors (Akese *et al.*, 2014:48). In this study, the majority of nurses demonstrated limited knowledge of the risk assessment theme 36% (n=82). These results are like studies done in German hospitals and Belgium nursing homes, where risk assessment was not optimally implied (Hoviattalab *et al.*, 2015:1521; Demarré *et al.*, 2012:1425).

Knowledge of nurses on the theme of 'nutrition' was high at 75.9% (n=173) compared with the respondents' knowledge level on PU aetiology and development, classification and observation, and risk assessment. This difference may be explained by the fact that it was represented only by a single item or the structure of the question. The question asks the respondents to identify the correct answer from statements addressing the cause, cost and contribution of nutrition to general health. Such an approach would allow internal consistency in the evaluation of this theme. Nutritional supplements, however, cannot replace pressure relief for the prevention of PUs.

In theme 5, reduction of the magnitude of pressure and shearing, the respondents' knowledge deficit is statistically significant regarding the proper positioning of patients. Another study done in Sweden showed undesirable results in the same theme (Gunningberg *et al.*, 2015:4).

Theme 6, pressure relief (e.g. repositioning, mattresses, chair cushions and heel cushions) focussed on the mainstay of preventive measures, but the respondents did not know the correct use of pressure relief devices. Their knowledge was found to be insufficient in all themes except in the nutrition theme (n=173) 75.9%. Therefore, this study demonstrated nurses' knowledge deficit in the core areas of pressure ulcer aetiology and development at 52%, classification and observation 39%, risk assessment 36%, reduction of the magnitude of pressure and shearing 35.1%, and measures to reduce the duration of pressure or shear 39.5%. Similar results were obtained in a study done in Sweden, with their respondents' knowledge on reduction in the amount of pressure and shear at 47.5% and classification and observation at 55.5% (Gunningberg *et al.*, 2015:1). In another study in Belgium, the knowledge of nurses was insufficient in the major themes, for example; nutrition at 9%, aetiology and development at 25.9%, classification and development were 23.7%, reduction in the amount of pressure and shear 26.8%, and risk assessment 57.9% (Demarre *et al.*, 2011:1430).

A study by Athlin *et al.* (2009: 2255), described knowledge as an important factor to prevent pressure ulcers. The current study further showed inadequate knowledge and out-of-date knowledge about how to prevent pressure ulcers among nurses. In this study, the results confirmed that many PU prevention interventions in the two referral hospitals were still based on tradition, myth and past experiences like massaging bony prominences and the use of ring/doughnut cushions. Similar results were found in Nigeria (Ilesanmi *et al.*, 2012:24). In a study by Buss *et al.* (2004:674), pressure ulcer prevention was found not to be considered as an important issue in the daily work of nurses.

Statistical techniques were used to determine the strength of the relationship between variables. The correlation analysis of nurses' socio-demographic characteristics and knowledge of PU

prevention indicated a level of relationship in some of the variables. The older respondents had more knowledge about the importance of nutrition than the younger respondents in this study. The younger respondents in this study knew more about K25 on the theme: reduction of the duration of pressure or shear than the older respondents. The variables that were not statistically significant and therefore not reported were: knowledge of pressure ulcers prevention correlated with age, attitude and barriers. Similar findings of non-correlation were found in Iran (Iranmanesh *et al.*, 2013:4).

The following is a description of how the respondents' education correlated with knowledge of risk assessment. The highly educated nurses knew less about risk assessment (K12). However, highly educated nurses scored significantly higher in the knowledge of the reduction of pressure or shear (K23) than those with lower levels of education. These findings are comparable with the results found in Belgian hospitals (Beeckman *et al.*, 2011:174). The results are also in line with the study of three hospitals located in Ankara, Turkey, which found that educational background significantly influenced knowledge (Aydin & Karadag, 2010:493). In this study, those with more years of experience scored significantly higher on the aetiology and development (K1), stages of pressure ulcers (K11) and nutrition (K14), than those with fewer years of experience. Interesting, Iranmanesh *et al.* (2013:4) found no relationship between nurses' years of experiences and their level of knowledge regarding pressure ulcers.

A significant positive correlation was found between overall attitude and knowledge of risk assessment (K13) and reduction of the duration of pressure or shear (K23). This finding shows the relationship between what individuals recognise and how they feel about pressure ulcers' prevention. Attitudes were significantly correlated with adequate application knowledge on PU prevention. A positive attitude toward an issue is an important influencing factor that determines an individual's likelihood of practising positive behaviour (Unver *et al.*, 2013:278). A significant negative correlation was found between overall attitude and knowledge of aetiology and development (K2; K6), and classification and observation (K9). Moreover, a significant negative correlation was found between attitude over responsibility and knowledge of aetiology and development (K6), and reduction of the magnitude of pressure and shear (K16). There was also a significant negative correlation between attitude over personal competence and knowledge of reduction of the magnitude of pressure and shearing (K19), and reduction of the duration of pressure or shear (K24). A negative attitude toward pressure ulcer is an influencing factor that determines an individual's likelihood of practising negative behaviour towards pressure ulcer prevention.

The correlation between knowledge of and barriers to pressure ulcer prevention was identified with the following results. There was a significant positive correlation between knowledge

barriers and knowledge of classification and observation (K11), risk assessment (K13), and reduction of the magnitude of pressure and shearing (K16). Knowledge was found to be the most significant barrier experience of having a PU. A significant positive correlation was found between barriers related to the experience of psychological drain and knowledge of risk assessment (K13), nutrition (K14), and reduction of the magnitude of pressure and shearing (K15). There was also a significant positive relationship between barriers related to resources and knowledge about nutrition (K14). This study indicated that there was a significant positive correlation on knowledge of PUP.

5.2.2 Attitude assessment of the respondents on pressure ulcers prevention

An accurate assessment of attitudes towards pressure ulcers' prevention is an important step in identifying interventions to improve prevention. The validated Attitude toward Pressure Ulcer tool (APuP) was developed and used to study the attitudes of the nurses toward pressure ulcers' prevention by Beeckman in Belgian hospitals (Beeckman *et al.*, 2010b:1437).

The results from the psychometric evaluation of the attitude: pressure ulcers' prevention (APuP) indicated that the instrument and the subscales are reliable and the constructs valid to be used to assess attitudes towards pressure ulcers' prevention (Beeckman *et al.*, 2011:169). The instrument includes 11 items and reflects five subscale domains: (1) personal competency to prevent pressure ulcers, (2) priority of pressure ulcer prevention, (3) impact of pressure ulcers, (4) responsibility in pressure ulcer prevention, and (5) confidence in the effectiveness of prevention. All subscales together represented what in this study was postulated as attitudes towards pressure ulcers' preventive care.

Personal competency to prevent pressure ulcers as part of confidence in pressure ulcers' prevention had the lowest mean score of 32%. Some 23% of respondents had a positive attitude regarding training on pressure ulcers. This may reflect the low perceived competency and self-confidence levels of respondents in the study. The respondents may perceive themselves to be incompetent and therefore experience a need for more training. Similar results of the lowest mean score in personal competency were obtained in Turkey (Ünver *et al.*, 2017:280). Athlin *et al.* (2009:2255) described perceived competency among healthcare personnel as an essential factor to prevent pressure ulcers. The Cronbach's alpha of the subscale on personal competency was 0.610, which is good and an indicator that the subscale was reliable.

On the attitude regarding the priority of pressure ulcers' prevention, 71.5% (n=163) of respondents in this study had a positive attitude toward their prevention as a priority. If

prevention of pressure ulcers is rated as a priority, there is a high chance that preventive measures will be implemented.

The financial impact of pressure ulcers' prevention affected a positive attitude in only 38.6% (n=88) of respondents. Evidence concerning the impact of pressure ulcers on patients and society was reported by multiple researchers (Hopkins *et al.*, 2006:345; Essex *et al.*, 2009:797; Lardenoye *et al.*, 2009:1797; Gorecki *et al.*, 2009:1177). If pressure ulcers are considered by nurses as being of low impact, it is unlikely that patients can expect good preventive care.

A total of 68.9% (n=157) of respondents had a positive attitude regarding their responsibility in pressure ulcers' prevention. The nurses' responsibility is an important factor in pressure ulcer preventive care, and this responsibility should include prevention, risk assessment and the supervision of Registered nurses (RN) in Botswana (Athlin *et al.*, 2009:2254). The respondents' attitude as it relates to responsibility delivered a Cronbach's alpha calculation of 0.588, which is acceptable since it is close to 0.6.

Likewise, the confidence in the effectiveness of prevention' was relatively low, at 46.1% (n=105) of respondents who had a positive attitude. In this study, it appears that nurses do not have confidence in pressure ulcer prevention. The Cronbach's alpha for the subscale on confidence in prevention was 0.771, which indicates that this section of the instrument is reliable. In this study, the overall attitude of nurses was negative, and only a few showed a positive attitude towards pressure ulcers prevention. The results are similar to those in a study in Sweden, where nurses showed a negative attitude (Gunningberg *et al.*, 2015:5). In contrast, the results of a study conducted in nursing homes in Belgium indicated that respondents had positive results towards pressure ulcers' prevention (Demarré *et al.*, 2012:1425). In a study in Addis Ababa Government hospitals, Ethiopian nurses also had a positive attitude about PU prevention (Dilie & Mengistu, 2015:9).

5.2.3 Barriers to pressure ulcers prevention

Construct validity of the barrier section of the instrument was assessed in a factor analysis by using a principal component analysis (PCA). PCA was used because it is a well-suited approach to combine a large number of items into a few principal factors. Principal component analysis is an easily understood method of factor analysis and a commonly used extraction technique (Olawale & Garwe, 2010:733). PU prevention among nurses was found to be influenced by barriers related to knowledge barriers, psychological draining barriers and resource barriers.

In this study, 80% of respondents identified several knowledge factors as barriers. These barriers include factors such as inadequate coverage of pressure ulcers during training, inadequate knowledge about pressure ulcers among nurses, lack of universal guidelines on prevention of pressure ulcers, and poor access to literature about pressure ulcers by nurses. These results are similar to the results of other studies done in other countries (Qaddum & Khawaldeh, 2014:1; Löfvenmark *et al.*, 2017:1; Delie & Mengistu, 2015:2; Strand & Lindgren, 2010: 338; Tallier *et al.*, 2017:108; Tubaishat *et al.*, 2013:2).

Altogether 67% of respondents in this study identified psychological factors as barriers to pressure ulcers' prevention. These barriers were the following: lack of multidisciplinary team members or uncooperative behaviour among nurses, lack of time, lack of job satisfaction in the nursing profession, presence of other priorities than pressure ulcers, and uncooperative patients. The findings correspond with other studies that had similar findings (Strand & Lindgren, 2010:338; Delie & Mengistu, 2015:2; Löfvenmark *et al.*, 2017:1; Tallier *et al.*, 2017:108; Tubaishat *et al.*, 2013:2).

In this study, resource barriers were the barriers that respondents encountered the most (96%). These barriers include a shortage of pressure-relieving devices or equipment used for pressure ulcer care, heavy workload, and lack of adequate staffing. The findings of this study are in line with other studies (Delie & Mengistu, 2015:2; Qaddum & Khawaldeh, 2014:6; Strand & Lindgren, 2010: 338; Nuru *et al.*, 2015:40; Mwebeza *et al.*, 2014:4; Löfvenmark *et al.*, 2017:1).

Barriers to carrying out pressure ulcers' preventative measures are common. It is important for nurses to be aware of any barriers that may hinder good practice in the prevention of PU and find strategies to overcome them.

5.3 Conclusion

Chapter 5 included a discussion on the results of this study. In this chapter, nurses in the selected referral hospitals in Botswana portrayed insufficient knowledge of pressure ulcers' prevention as evidenced by nurses' knowledge deficit in core areas on pressure ulcer aetiology and development (52%), classification and observation (39%), risk assessment (36%) nutrition (75.9%), reduction of the magnitude of pressure and shearing (35.1%), and measures to reduce the duration of pressure or shear (39.5%).

The respondents had a negative attitude towards the theme 'personal competency', and only 32% indicated a positive attitude. For the impact of pressure ulcers theme, 38.6% had a positive attitude. A total of 71.5% of respondents had a positive attitude towards pressure ulcers as a priority. The respondents also identified barriers that hinder the prevention of pressure ulcers.

The most common barriers were the resource barriers (96.5%), followed by the knowledge-barriers (80%) and then psychological draining as a barrier at 67%.

This study is significant in that it reflects a dearth in nurses' knowledge, and negative attitude of pressure ulcers' prevention in two selected referral hospitals in Botswana. The occurrence of pressure ulcers is an index that can be used to determine the quality of care the nurses rendered. A Jordanian nurses' study (Qaddum & Khawaldeh, 2014:2) emphasises the importance of knowledge of nurses to prevent pressure ulcers.

Despite the knowledge deficit, negative attitude and barriers of pressure ulcers prevention, the researcher concludes that respondents in the study lack the clinical skills and ability to identify the onset of pressure ulcers correctly. These results serve as a basis for developing an effective strategy to improve nursing practice in this area and the promotion of evidence-based care. Barriers concerning the implementation of preventive measures must be recognised and dealt with in order to improve the quality of practise.

The last chapter (Chapter 6) aimed to provide the research-based evidence on knowledge, attitudes and perceived barriers of nurses towards pressure ulcers' prevention in two selected referral hospitals in Botswana. This coincides with the Botswana Ministry of Health and Wellness' vision for the prevention of pressure ulcers. The evidence is based on the findings of this study. In Chapter 6, the researcher will summarise the study and outline the findings, describe limitations and recommendations and finally conclude this study.

CHAPTER 6: SUMMARY OF THE STUDY AND RECOMMENDATIONS

6.1 Introduction

This chapter includes a summary of the study. The researcher draws overall conclusions from the results of the study and provides recommendations for the successful utilisation of the evidence found during this study on the prevention of pressure ulcers. The chapter also acknowledges limitations and provides recommendations for further research.

6.2 Summary of the study

Chapter 1 introduced the study on nurses' knowledge, attitude and barriers towards pressure ulcers' prevention. The chapter provided an overview of the introduction and background to the study, followed by a problem statement. The chapter further presented research questions, the research aim, objectives and paradigmatic perspectives. Section 1.4.2 of this study stated that the aim of this research was to describe nurses' knowledge, attitudes and barriers towards pressure ulcers' prevention in the two selected referral hospitals of Botswana. The chapter also presented the ethical considerations of the study.

In chapter 2, the researcher presented a literature review on pressure ulcers' prevention, which indicated that knowledge deficit of pressure ulcers is a global concern. Pressure ulcers were discussed in detail in this chapter, for example, stages of pressure ulcers, and risk factors and causes.

Chapter 3 includes an overview of the methodology applied to answer the research questions and study design.

Chapter 4 reported on the analysis of data and results. In this chapter, the reliability of the data collection instrument was confirmed and the attitude and barrier instrument was found to be reliable. The knowledge assessment instrument was found not to be reliable as a group or subsections. The questions in this section were assessed individually. The results were presented as frequencies, percentages, tables and graphs.

Chapter 5 included a discussion on the results of this study. In this chapter, nurses in the two selected referral hospitals in Botswana portrayed insufficient knowledge in pressure ulcers' prevention as evidenced by nurses' knowledge deficit in core areas on pressure ulcer aetiology and development, classification and observation, risk assessment, nutrition, reduction of the magnitude of pressure and shearing and measures to reduce the duration of pressure or shear.

The respondents had a negative attitude towards the theme 'personal competency'. For the impact of pressure ulcers' theme, few nurses had a positive attitude. For the attitude towards pressure ulcers as a priority, a total of 71.5% of respondents had a positive attitude. The respondents also identified barriers that hinder the prevention of pressure ulcers. The most common barriers were the resource barriers, followed by the knowledge-barriers and then the psychological draining as a barrier.

The statistical correlation was used to study the strength of a relationship between variables, for example, correlation of knowledge on pressure ulcers with age, education, years of experience attitude and barriers. This chapter includes recommendations to nurses which can promote evidence-based practice.

6.3 Recommendations

The following recommendations are suggested to improve nurses' knowledge, attitude and perception of barriers towards the prevention of pressure ulcers.

6.3.1 Recommendations for practice

The results of the study serve as a basis for the recommendation of an effective strategy to improve nursing practice in this area and the promotion of evidence-based care

- In-service training and refresher courses about pressure ulcers' prevention should be designed for nurses in Botswana. This should provide them with updated knowledge to understand pressure ulcer prevention which can be used in practice. The current study showed inadequate knowledge and out-of-date knowledge about how to prevent pressure ulcers among nurses.
- Hospital policies and guidelines are needed to promote and maintain nurses' attitude in relation to pressure ulcers' prevention as a significant negative correlation was found between overall attitude and knowledge of aetiology and development, and classification and observation

6.3.2 Recommendations for education

- Nurse educators, both involved in basic nursing education and in-service training, have an important role in developing education methods to improve both knowledge and attitudes toward pressure ulcers' prevention.

- A training programme on pressure ulcers' prevention should also be conducted for nurse educators to transmit to students. Pressure ulcers' prevention results in this study confirmed that interventions in two selected referral hospitals are based on tradition, myth and past experiences like massaging bony prominences and the use of ring/doughnut cushions.
- The Botswana quality guidelines regarding the prevention of pressure ulcers should be available and accessible to nurses to be fully implemented in clinical practice.

6.3.3 Recommendations for policymakers

- Adequate manpower should be employed in the department of clinical services (nursing) to compliment the efforts of the nurses with adequate staffing to overcome the shortage of staff as indicated in the study that shortage of staff is a barrier to pressure ulcers' prevention.
- Modern and state of the art equipment in the prevention of pressure ulcers should be made available by hospitals' management to facilitate quality pressure ulcer prevention. The respondents indicated resource barriers as the most significant barrier tot PUP.

6.3.4 Recommendations for researchers

- The results of this study should be shared with stakeholders such as nurse managers, nurse researchers and nurse clinicians. Future researchers in Botswana are recommended to further investigate nurses' practice and skills to prevent pressure ulcers
- Further intervention studies to pressure ulcers' prevention should be initiated to assess the nurses' knowledge and attitude before and after nurses participate in in-service training programmes.

6.4 Study limitations

The research has numerous downsides, which need to be considered when interpreting this data. Data was gathered by using a self-administered questionnaire, which did not collect data on the respondents' actual practice or attitudes. This can be overcome by incorporating an observational study, which will enable the investigator to observe the actual hands-on pressure ulcers' prevention practices among nurses. However, it was not feasible to conduct such a study due to the high workload and time restraints in the selected hospitals.

Another limitation is that the knowledge assessment questions instrument was found not to be reliable as a whole where a Cronbach's alpha was 0.440. As this knowledge assessment

measuring instrument was not reliable, the questions were assessed individually and found to be reliable individually.

The study was a quantitative, cross-sectional study in which the aim was not to have an in-depth understanding of the reasons for inadequate knowledge on pressure ulcers' prevention at PMH and NRH. In addition, qualitative interviews may have allowed respondents to highlight concerns about the implementation practises in their clinical arena in a way that is not possible with a questionnaire. Despite these limitations, this study represents a useful addition to the understanding of the knowledge and attitudes as reported by the nurses surveyed and can form the basis for evaluating interventions in this area.

6.5 Conclusion

In conclusion, this is the first study conducted in Botswana about nurses' knowledge, attitude and barriers regarding pressure ulcers' prevention in referral hospitals in Botswana. The overall adequacy of pressure ulcer prevention in Princess Marina hospital and Nyangabgwe Referral hospital was poor, and knowledge in nurses was inadequate. The attitude of nurses was negative regarding pressure ulcers' prevention. Pressure ulcer prevention is of major importance in today's health care environment.

However, despite the increasing expenditure on pressure ulcers' prevention, neither the incidence nor prevalence of pressure ulcers is reducing, while the increasing proportion of older people is likely to exacerbate the situation. The study highlights the urgent need for introducing measures to increase knowledge on pressure ulcers' prevention and improve the attitude of nurses and reduce barriers on pressure ulcers, which may play a very important role in the prevention of pressure ulcers in Botswana and, as a result, reduce patient suffering and prolonged hospital stay.

LIST OF REFERENCES

- Adegoke, B.O.A., Odole, A.C., Akindele, L.O. & Akinpelu, A.O. 2013. Pressure ulcer prevalence among hospitalised adults in university hospitals in South-west Nigeria. *Journal of the Australian wound management association*, 21(3):128.
- Akese, M.I., Adejumo, P.O., Ilesanmi, R.E. & Obilor, H.N. 2014. Assessment of nurses' knowledge on evidence-based preventive practices for pressure ulcer risk reduction in patients with impaired mobility. *African journal of medicine and medical sciences*, 43(3):251-258.
- Alligood, M.R. 2013. *Nursing theory Utilization and application*. Oklahoma: Elsevier Health Sciences.
- Anders, J., Heinemann, A., Leffmann, C., Leutenegger, M., Pröfener, F. & von Renteln-Kruse, W. 2010. Decubitus ulcers: pathophysiology and primary prevention. *Deutsches arzteblatt international*, 107(21):371.
- Athlin, E., Idvall, E., Jernfält M. & Johansson, I. 2010. Factors of importance to the development of pressure ulcers in the care trajectory: perceptions of hospital and community care nurses. *Journal of clinical nursing*, 19(15-16):2252-2258.
- Aydin, A.K. & Karadag, A. 2010. Assessment of nurses' knowledge and practice in prevention and management of deep tissue injury and stage I pressure ulcer. *Journal of Wound Ostomy & Continence Nursing*, 37(5):487-494.
- Baldelli, P. & Paciella, M. 2008. Creation and implementation of a pressure ulcer prevention bundle improves patient outcomes. *American Journal of Medical Quality*, 23(2):136-142.
- Bareki, P. & Tenego, T., 2018. Assessment of knowledge, attitudes and practices of HIV post exposure prophylaxis among the doctors and nurses in Princess Marina Hospital, Gaborone: a cross-sectional study. *Pan African Medical Journal*, 30(1).
- Beeckman, D., Defloor, T., Demarré, L., Van Hecke, A. & Vanderwee, K. 2010a. Pressure ulcers: Development and psychometric evaluation of the Attitude towards Pressure ulcer Prevention instrument (APuP). *International journal of nursing studies*, 47(11):1432-1441.
- Beeckman, D., Defloor, T., Schoonhoven, L. & Vanderwee, K. 2011. Knowledge and attitudes of nurses on pressure ulcer prevention: A cross-sectional multicenter study in Belgian hospitals. *Worldviews on Evidence-Based Nursing*, 8(3):166-176.

- Beeckman, D., Schoonhoven, L., Fletcher, J., Furtado, K., Gunningberg, L., Heyman, H., Lindholm, C., Paquay, L., Verdu, J. & Defloor, T. 2007. EPUAP classification system for pressure ulcers: European reliability study. *Journal of advanced nursing*, 60(6):682-691.
- Beeckman, D., Vanderwee, K., Demarré, L., Paquay, L., Van Hecke, A. & Defloor, T. 2010b. Pressure ulcer prevention: development and psychometric validation of a knowledge assessment instrument. *International Journal of Nursing Studies*, 47(4):399-410.
- Bhattacharya, S. & Mishra, R.K. 2015. Pressure ulcers: Current understanding and newer modalities of treatment. *Indian journal of plastic surgery: official publication of the Association of Plastic Surgeons of India*, 48(1):4.
- Black, J., Baharestani, M.M., Cuddigan, J., Dorner, B., Edsberg, L., Langemo, D., Posthauer, M.E., Ratliff, C. & Taler, G. 2007. National Pressure Ulcer Advisory Panel's updated pressure ulcer staging system. *Advances in skin & wound care*, 20(5):269-274.
- Black, J.M., Edsberg, L.E., Baharestani, M.M., Langemo, D., Goldberg, M., McNichol, L. & Cuddigan, J. 2011. Pressure ulcers: avoidable or unavoidable? Results of the national pressure ulcer advisory panel consensus conference. *Ostomy-wound management*, 57(2):24.
- Bluestein, D. & Javaheri, A. 2008. Pressure ulcers: prevention, evaluation, and management. *American family physician*, 78(10):1186.
- Botma, Y., Greeff, M., Mulaudzi, F. M. & Wright, S. C.D. 2010. *Research in health sciences*. Cape Town: Pearson.
- Brick, J.M. 2011. The future of survey sampling. *Public Opinion Quarterly*, 75(5):872-888.
- Brink, H., Van der Walt, C. & Van Rensburg, G. 2012. 3rd ed. *Fundamentals of research methodology for healthcare professionals*. Cape Town: Juta & Co.
- Buss, I.C., Halfens, R.J., Abu-Saad, H.H. & Kok, G. 2004. Pressure ulcer prevention in nursing homes: views and beliefs of enrolled nurses and other health care workers. *Journal of Clinical Nursing*, 13(6):668-676.
- Butcher, M. & Thompson, G. 2009. Dressings can prevent pressure ulcers: fact or fallacy? The problem of pressure ulcer prevention. *Wounds United Kingdom*, 5(4):80-93.
- Caruso, N., Chandra, A. & Kestler, A. 2011. Development of emergency medicine in Botswana. *African Journal of Emergency Medicine*, 1(3):108-112.

- Chandra, A., Mullan, P., Ho-Foster, A., Langeveldt, A., Caruso, N., Motsumi, J. & Kestler, A. 2014. Epidemiology of patients presenting to the emergency centre of Princess Marina Hospital in Gaborone, Botswana. *African Journal of Emergency Medicine*, 4(3):109-114.
- Chianca, T.C., Rezende, J.F., Borges, E.L., Nogueira, V.L. & Caliri, M.H. 2010. Pressure ulcer knowledge among nurses in a Brazilian university hospital. *Ostomy Wound Manage*, 56(10):58-64.
- Coloplast. 2012. Pressure ulcers: prevention and treatment: a Coloplast quick guide. [https://www.coloplast.us/Global/US/Wound_Care/Pressure Ulcers - Prevention and Treatment Quick Guide M4006N.pdf](https://www.coloplast.us/Global/US/Wound_Care/Pressure_Ulcers_-_Prevention_and_Treatment_Quick_Guide_M4006N.pdf) Date of access: 10 Aug. 2017.
- Cooper, K.L. 2013. Evidence-based prevention of pressure ulcers in the intensive care unit. *Critical care nurse*, 33(6):57-66.
- Crotty, M. 2003. *The Foundations of Social Research: meaning and perspective in the research process*. Sage, London.
- Dealey, C., Brindle, C.T., Black, J., Alves, P., Santamaria, N., Call, E. & Clark, M. 2015. Challenges in pressure ulcer prevention. *International wound journal*, 12(3):309-312.
- Demarré, L., Vanderwee, K., Defloor, T., Verhaeghe, S., Schoonhoven, L. & Beeckman, D. 2012. Pressure ulcers: knowledge and attitude of nurses and nursing assistants in Belgian nursing homes. *Journal of Clinical Nursing*, 21(9-10):1425-1434.
- Díez-Manglano, J., Fernández-Jiménez, C., Lambán-Aranda, M.P., Landa-Santesteban, M.C., de Isasmendi-Pérez, S.I., Moreno-García, P., Bejarano-Tello, E., Barranco-Usón, J., Munilla-López, E. and del Corral-Beamonte, E. 2016. Pressure ulcers in patients hospitalized in internal medicine: Associated factors and mortality. *Revista clinica espanola*, 216(9):461-467.
- Dilie, A. & Mengistu, D. 2015. Assessment of Nurses' Knowledge, Attitude, and Perceived Barriers to Expressed Pressure Ulcer Prevention Practice in Addis Ababa Government Hospitals, Addis Ababa, Ethiopia, 2015. *Advances in nursing*, Article ID 796927. <http://dx.doi.org/10.1155/2015/796927/> Date of access: 27 Aug. 2017.
- Dorner, B., Posthauer, M.E. & Thomas, D. 2009. The role of nutrition in pressure ulcer prevention and treatment: National Pressure Ulcer Advisory Panel white paper. *Advances in skin & wound care*, 22(5):212-221.
- Duncan, K.D. 2007. Preventing pressure ulcers: the goal is zero. *The joint commission journal on quality and patient safety*, 33(10):605-610.

Elliott, J. 2010. Strategies to improve the prevention of pressure ulcers. *Nursing Older People*, 22(9):31-36.

Essex, H.N., Clark, M., Sims, J., Warriner, A. & Cullum, N. 2009. Health-related quality of life in hospital in-patients with pressure ulceration: assessment using generic health-related quality of life measures. *Wound repair and regeneration*, 17(6):797-805.

Etafa, W., Argaw, Z., Gemechu, E. & Melese, B. 2018. Nurses' attitude and perceived barriers to pressure ulcer prevention. *BioMed Central nursing*, 17(1):14.

Etafa, W. 2015. Assessment of nurses' knowledge, attitude and practice towards pressure ulcer prevention for hospitalized patients in public hospitals in Addis Ababa. Ethiopia Addis Ababa: University College of Health Sciences. (Thesis- Masters).

Fako, T.T., Forchheh, N. & Balogi, K.T. 2002. Productivity among nurses and midwives in Botswana. *African Sociological Review/Revue Africaine de Sociologie*, 6(1):148-160.

Fouché, C. B., Delport, C.S.L. & A. S. De Vos. 2011. Quantitative research designs. In: *de Vos, A.S., Strydom, H., Fouché, C.B. & Delport, C.H.L. eds. Research at grass roots: For the social sciences and human services professions*. Pretoria: Van Schaik.

Fu Shaw, L., Chang, P.C., Lee, J.F., Kung, H.Y. & Tung, T.H. 2014. Incidence and predicted risk factors of pressure ulcers in surgical patients: experience at a medical center in Taipei, Taiwan. *Biomedical research international*, Article ID 416896. <http://dx.doi.org/10.1155/2014/416896/> Date of access: 27 Aug. 2017.

Gage, W. 2015. Preventing pressure ulcers in patients in intensive care. *Nursing standard*, 29(26):53-61.

Gerrish, K. & Lacey, A. 2010. The research process in nursing. Oxford: Wiley-Blackwell.

Giaquinto-Cilliers, M.G.C. & Kotzé, J. 2014. Pressure ulcers: surgical intervention. *Wound Healing Southern Africa*, 7(2):.45-52.

Gorecki, C., Brown, J.M., Nelson, A.E., Briggs, M., Schoonhoven, L. Dealey, C., Defloor, T. & Nixon, J. 2009. Impact of pressure ulcers on quality of life in older patients: a systematic review. *Journal of the American Geriatrics Society*, 57(7):1175-1183.

Gorecki, C., Closs, S.J., Nixon, J. & Briggs, M. 2011. Patient-reported pressure ulcer pain: a mixed-methods systematic review. *Journal of pain and symptom management*, 42(3):443-459.

- Gunningberg, L., Lindholm, C., Carlsson, M. & Sjöden, P. 2001. Risk, prevention and treatment of pressure ulcers: nursing staff knowledge and documentation. *Scandinavian journal of caring sciences*, 15(3):257-263.
- Gunningberg, L., Mårtensson, G., Mamhidir, A.G., Florin, J., Muntlin Athlin, Å. & Bååth, C. 2015. Pressure ulcer knowledge of registered nurses, assistant nurses and student nurses: a descriptive, comparative multicentre study in Sweden. *International wound journal*, 12(4):462-468.
- Guy, H., Downie, F., McIntyre, L. & Peters, J. 2013. Pressure ulcer prevention: making a difference across a health authority? *British journal of nursing*, 22(12):4-13.
- Heyneman, A., Vanderwee, K., Grypdonck, M. & Defloor, T. 2009. Effectiveness of two cushions in the prevention of heel pressure ulcers. *Worldviews on evidence-based nursing*, 6(2):114-120.
- Hitzig, S.L., Balioussis, C., Nussbaum, E., McGillivray, C.F., Catharine Craven, B. & Noreau, L. 2013. Identifying and classifying quality-of-life tools for assessing pressure ulcers after spinal cord injury. *The journal of spinal cord medicine*, 36(6):600-615.
- Hopkins, A., Dealey, C., Bale, S., Defloor, T. & Worboys, F. 2006. Patient stories of living with a pressure ulcer. *Journal of advanced nursing*, 56(4):345-353.
- Hoviattalab, K., Hashemizadeh, H., D'Cruz, G., Halfens, R.J. & Dassen, T. 2015. Nursing practice in the prevention of pressure ulcers: an observational study of German Hospitals. *Journal of clinical nursing*, 24(11-12):1513-1524.
- Ilesanmi, R., Ofi, B. & Adejumo, P.O. 2012. Nurses' knowledge of pressure ulcer prevention in Ogun State, Nigeria: results of a pilot survey. *Ostomy wound management*, 58(2):24-32.
- Introcaso, C.E. & Kovarik, C.L. 2011. Dermatology in Botswana: the American Academy of Dermatology's resident international grant. *Dermatologic clinics*, 29(1):63-67.
- Iranmanesh, S., Rafiei, H. & Foroogh Ameri, G. 2011. Critical care nurses' knowledge about pressure ulcer in southeast of Iran. *International wound journal*, 8(5):459-464.
- Iranmanesh, S., Tafti, A.A., Rafiei, H., Dehghan, M. & Razban, F. 2013. Orthopaedic nurses' knowledge about pressure ulcers in Iran: a cross-sectional study. *Journal of wound care*, 22(3):138-143.

Islam, S. 2010. Nurses' Knowledge, Attitude, and Practice Regarding Pressure Ulcer Prevention for Hospitalized Patients at Rajshahi Medical College Hospital in Bangladesh Prince of Songkla University (Thesis-PhD).

Jankowski, I.M. & Nadzam, D.M. 2011. Identifying gaps, barriers, and solutions in implementing pressure ulcer prevention programs. *The Joint Commission Journal on Quality and Patient Safety*, 37(6):253-264.

Jarosova, D. 2014. Supporting material: nursing theories and models. <https://www.studocu.com/ph/document/our-lady-of-fatima-university/nursing/lecture-notes/nursing-theories-and-models/3092804/view> Date of access: 27 Aug. 2020.

Jiang, Q., Li, X., Qu, X., Liu, Y., Zhang, L., Su, C., Guo, X., Chen, Y., Zhu, Y., Jia, J. & Bo, S. 2014. The incidence, risk factors and characteristics of pressure ulcers in hospitalized patients in China. *International journal of clinical and experimental pathology*, 7(5):2587.

Kaddourah, B., Abu-Shaheen, A.K. & Al-Tannir, M. 2016. Knowledge and attitudes of health professionals towards pressure ulcers at a rehabilitation hospital: a cross-sectional study. *BMC nursing*, 15, art 17. <http://dx.doi.org.nwulib.nwu.ac.za/10.1186/s12912-016-0138-6> Date of access 27 Aug. 2020.

Källman, U. & Suserud, B.O. 2009. Knowledge, attitudes and practice among nursing staff concerning pressure ulcer prevention and treatment—a survey in a Swedish healthcare setting. *Scandinavian journal of caring sciences*, 23(2):334-341.

Kapungumberi, L.T. 2018. Hepatitis B prevention and control: knowledge, attitudes and vaccination status of registered nurses at Nyangabgwe hospital in Francistown, Botswana, University of South Africa (Thesis-PhD).

Kharabsheh, M.S.A.R., Alrimawi, R.F.A.R., Al Assaf, R. & Saleh, M. 2014. Exploring nurses' knowledge and perceived barriers to carry out pressure ulcer prevention and treatment, documentation, and risk assessment. *American International Journal of Contemporary Research*, 4(4):112-119.

Kim, J., Ahn, H., Lyon, D.E. & Stechmiller, J. 2016. Building a biopsychosocial conceptual framework to explore pressure ulcer pain for hospitalized patients. In *Healthcare, Multidisciplinary Digital Publishing Institute*, 4(1):7. <https://doi.org/10.3390/healthcare4010007> Date of access 11 Aug. 2017.

- Klopper, H. & Uys, L.R. 2013. The state of nursing and nursing education in Africa: *a country-by-country review*. Sigma Theta Tau.
- Kothari, C.R. 2004. *Research methodology: Methods and techniques*. 2nd ed. Ansari Road, Daryanganj, New Delhi. New Age International.
- Kotrlík, J.W.K.J.W. & Higgins, C.C.H.C.C. 2001. Organizational research: Determining appropriate sample size in survey research appropriate sample size in survey research. *Information technology, learning, and performance journal*, 19(1):.43.
- Kruger, E.A., Pires, M., Ngann, Y., Sterling, M. & Rubayi, S. 2013. Comprehensive management of pressure ulcers in spinal cord injury: current concepts and future trends. *The journal of spinal cord medicine*, 36(6):572-585.
- Lardenoye, J.W.H.P., Thiéfaïne, J.A.J.G. & Breslau, P.J. 2009. Assessment of incidence, cause and consequences of pressure ulcers to evaluate quality of provided care. *Dermatologic surgery*, 35(11):1797-1803.
- Lee, S.W. 2013. Overview of nursing theory. *Study of nursing science*, 12(2):58-67.
- Löfvenmark, I., Hasselberg, M., Wikmar, L.N., Hultling, C. & Norrbrink, C. 2017. Outcomes after acute traumatic spinal cord injury in Botswana: from admission to discharge. *Spinal cord*, 55(2):208-212.
- Lyder, C.H., 2011. Preventing heel pressure ulcers: economic and legal implications. *Nursing management*, 42(11):16-19.
- Loudon, H. 2016. Managing wound infection and a look at antibiotic stewardship. In Welcome to Coloplast/Orthosurge CPD evening, 30 March 2016.14-42
[https://www.coloplast.co.za/Global/South Africa/Coloplast Pressure Ulcer Presentation \(2\).pdf](https://www.coloplast.co.za/Global/South Africa/Coloplast Pressure Ulcer Presentation (2).pdf)
 Date of access: 11 Aug. 2017.
- Madondo, A., MacIntyre, U.E. & Ntuli, B. 2012. The clinical and anthropometric profile of undernourished children aged under 5 admitted to Nyangabgwe Referral Hospital in Botswana. *South African Journal of Child Health*, 6(4):125-127.
- Mallah, Z., Nassar, N. & Badr, L.K. 2015. The effectiveness of a pressure ulcer intervention program on the prevalence of hospital acquired pressure ulcers: controlled before and after study. *Applied nursing research*, 28(2):106-113.

Mishu, M.C., Dubey, V.N., Hickish, T.F. & Cole, J. 2014. A Review on Pressure Ulcer: Aetiology, Cost, Detection and Prevention Systems. *International Journal of Engineering Sciences & Research Technology*, 3(9):419-428.

Moore, Z. & Price, P. 2004. Nurses' attitudes, behaviours and perceived barriers towards pressure ulcer prevention. *Journal of clinical nursing*, 13(8):942-951.

Moore, Z.E.H. & Cowman, S. 2014 Risk assessment tools for the prevention of pressure ulcers. *Cochrane database of systematic reviews*, 2: article no. CD006471.

Mwebaza, I., Katende, G., Groves, S. & Nankumbi, J. 2014. Nurses' knowledge, practices, and barriers in care of patients with pressure ulcers in a Ugandan teaching hospital. *Nursing research and practice*, Article ID 973602. <https://www.hindawi.com/journals/nrp/2014/973602/abs/> Date of access: 11 Aug. 2017.

Nuru, N., Zewdu, F., Amsalu, S. & Mehretie, Y. 2015. Knowledge and practice of nurses towards prevention of pressure ulcer and associated factors in Gondar University Hospital, Northwest Ethiopia. *Biomedical central nursing*, 14, art #34. <https://doi.org/10.1186/s12912-015-0076-8> Date of access 11 Aug.2017.

Nwadinigwe, C.U., Anyaehie, U.E. & Onyegbule, E.C. 2012. The impact of water mattresses on incidence of PUs in patients with spinal cord injuries in Nigeria. *Journal of wound care*, 21(4):184-189.

Olawale, F. & Garwe, D. 2010. Obstacles to the growth of new SMEs in South Africa: A principal component analysis approach. *African journal of Business management*, 4(5):729-738.

Orem, D.E. 2004. Reflections on nursing practice science: the nature, the structure and the foundation of nursing sciences. *Self-Care, Dependent-Care & Nursing*, 12(3):4-11.

Ostadabbas, S., Yousefi, R., Nourani, M., Faezipour, M., Tamil, L. & Pompeo, M.Q. 2012. A resource-efficient planning for pressure ulcer prevention. *Institute of electrical and electronics engineers transactions on information Technology in biomedicine*, 16(6):1265-1273.

Panagiotopoulou, K. & Kerr, S.M. 2002. Pressure area care: an exploration of Greek nurses' knowledge and practice. *Journal of Advanced Nursing*, 40(3):285-296.

Panagiotopoulou, K. and Kerr, S.M. 2002. Pressure area care: an exploration of Greek nurses' knowledge and practice. *Journal of Advanced Nursing*, 40(3):285-296.

Pasek, T.A., Geyser, A., Sidoni, M., Harris, P., Warner, J.A., Spence, A., Trent, A., Lazzaro, L., Balach, J., Bakota, A. & Weicheck, S. 2008. Skin care team in the pediatric intensive care unit: a model for excellence. *Critical care nurse*, 28(2):125-135.

Perry, D., Borchert, K., Burke, S., Chick, K., Johnson, K., Kraft, W., Patel, B. & Thompson, S. 2012. Health care protocol: pressure ulcer prevention and treatment protocol. <https://pdfs.semanticscholar.org/6261/0a54839fd7a0067a6030cab9b49507663a14.pdf> Date of access 10 Aug. 2017.

Potter, P.A. & Perry, A.G. 2009. *Critical thinking in nursing practice. Fundamentals of Nursing*. PA Potter, AG. Perry (Ed.), 7th ed. Mosby Elsevier, St. Louis, Missouri.

Primiano, M., Friend, M., McClure, C., Nardi, S., Fix, L., Schafer, M., Savochka, K. & McNett, M. 2011. Pressure ulcer prevalence and risk factors during prolonged surgical procedures. *Association of perioperative registered nurses journal*, 94(6):555-566.

Purcell, S., Cherny, S.S. & Sham, P.C. 2003. Genetic Power Calculator: design of linkage and association genetic mapping studies of complex traits. *Bioinformatics*, 19(1):149-150.

Qaddumi, J. & Khawaldeh, A. 2014. Pressure ulcer prevention knowledge among Jordanian nurses: a cross-sectional study. *BMC Nursing*, 13(1)art. #6. doi.org/10.1186/1472-6955-13-6 Date of access 27 Aug. 2020.

Qaseem, A., Mir, T.P., Starkey, M. & Denberg, T.D. 2015. Risk assessment and prevention of pressure ulcers: a clinical practice guideline from the American College of Physicians. *Annals of internal medicine*, 162(5):359-369.

Saleh, M.Y., Qaddumi, J.A.S. & Anthony, D. 2012. An interventional study on the effects of pressure ulcer education on Jordanian registered nurses' knowledge and practice. *Procedia-Social and Behavioural Sciences*, 47:2196-2206.

Schindler, C.A., Mikhailov, T.A., Kuhn, E.M., Christopher, J., Conway, P., Ridling, D., Scott, A.M. & Simpson, V.S. 2011. Protecting fragile skin: nursing interventions to decrease development of pressure ulcers in pediatric intensive care. *American Journal of Critical Care*, 20(1):26-35.

Schuele, C.M. & Justice, L.M. 2006. The importance of effect sizes in the interpretation of research: Primer on research: Part 3. *The ASHA Leader*, 11(10):14-27.

Seloiwe, E.S. & Thupayagale-Tshweneagae, G. 2007. Community mental health care in Botswana: approaches and opportunities. *International nursing review*, 54(2):173-178.

- Sharma, B. 2016. A focus on reliability in developmental research through Cronbach's Alpha among medical, dental and paramedical professionals. *Asian Pacific Journal of Health Sciences*, 3(4):271-278.
- Sherman, R.O., Chiang-Hanisko, L. & Koszalinski, R. 2013. The ageing nursing workforce: a global challenge. *Journal of Nursing Management*, 21(7):899-902.
- Shorney, R.H. 2014. Pressure ulcers through the eyes of the Department of Health United Kingdom. *Presentation delivered at the Coloplast Pressure Ulcer Summit, 2 July 2014.*
<https://www.coloplast.co.za/Documents/SouthAfrica/COLOPLASTPRESSUREULCERSUMMITPRESENTATIONS.pdf> Date of access: 11 Aug. 2017.
- Simonetti, V., Comparcini, D., Flacco, M.E., Di Giovanni, P. & Cicolini, G. 2015. Nursing students' knowledge and attitude on pressure ulcer prevention evidence-based guidelines: a multicenter cross-sectional study. *Nurse Education Today*, 35(4):573-579.
- Singh, A. & Masuku, M. 2014. Sampling techniques and determination of sample size in applied statistics research: *an overview*. *IjecomCoUk II* (11):1–22.
- Stansby, G., Avital, L., Jones, K. & Marsden, G. 2014. Prevention and management of pressure ulcers in primary and secondary care: summary of NICE guidance. *British Medical Journal*, 348:2592.
- Strand, T. & Lindgren, M. 2010. Knowledge, attitudes and barriers towards prevention of pressure ulcers in intensive care units: a descriptive cross-sectional study. *Intensive and critical care nursing*, 26(6):335-342.
- Taha, A.S. 2014. Nurses knowledge and practices related to pressure ulcer at intensive care unit. *Journal of international academic research for multidisciplinary*, 1:247.
- Tallier, P.C., Reineke, P.R., Asadoorian, K., Choonoo, J.G., Campo, M. & Malmgreen-Wallen, C. 2017. Perioperative registered nurses' knowledge, attitudes, behaviors, and barriers regarding pressure ulcer prevention in perioperative patients. *Applied Nursing Research*, 36:106-110.
- Tavakol, M. & Dennick, R. 2011. Making sense of Cronbach's alpha. *International journal of medical education*, 2(1):53-55.
- Trueman, P. & Whitehead, S.J. 2010. The economics of pressure relieving surfaces: an illustrative case study of the impact of high-specification surfaces on hospital finances. *International wound journal*, 7(1):48-54.

Uba, M.N., Alih, F.I., Kever, R.T. & Lola, N. 2015. Knowledge, attitude and practice of nurses toward pressure ulcer prevention in University of Maiduguri Teaching Hospital, Borno State, North-Eastern, Nigeria. *International journal of nursing and midwifery*, 7(4):54-60.

Ünver, S., Findık, Ü.Y., Özkan, Z.K. & Sürücü, Ç. 2017. Attitudes of surgical nurses towards pressure ulcer prevention. *Journal of tissue viability*, 26(4):277-281.

Walton-Geer, P.S. 2009. Prevention of pressure ulcers in the surgical patient. *Association of perioperative registered nurses journal*, 89(3):538-552.

WHO (World Health Organization). 1995. Constitution of the World Health Organization. https://www.who.int/governance/eb/who_constitution_en.pdf?ua=1 Date of access: 29 June 2020.

Woltman, H., Feldstain, A., MacKay, J.C. & Rocchi, M. 2012. An introduction to hierarchical linear modelling. *Tutorials in quantitative methods for psychology*, 8(1):52-69.

Worsley, P.R., Clarkson, P., Bader, D.L. & Schoonhoven, L. 2017. Identifying barriers and facilitators to participation in pressure ulcer prevention in allied healthcare professionals: a mixed methods evaluation. *Physiotherapy*, 103(3):304-310.

APPENDICES

APPENDIX A: ETHICS APPROVAL FROM NWU



Private Bag X1290, Potchefstroom
South Africa 2520

Tel: 018 299-1111/2222
Fax: 018 299-4910
Web: <http://www.nwu.ac.za>

Research Ethics Regulatory Committee
Tel: 018 299-4549
Email: nkosinathi.machine@nwu.ac.za

ETHICS APPROVAL LETTER OF STUDY

Based on approval by the North West University Health Research Ethics Committee (NWU-HREC) on 29/08/2018, the NWU Health Research Ethics Committee hereby approves your study as indicated below. This implies that the North-West University Research Ethics Regulatory Committee (NWU-RERC) grants its permission that, provided the special conditions specified below are met and pending any other authorisation that may be necessary, the study may be initiated, using the ethics number below.

Study title: Nurses' knowledge of and attitude to pressure ulcer prevention and the barriers they encounter in two referral hospitals in Botswana.

Study Leader/Supervisor (Principal Investigator)/Researcher: Dr S Scholtz

Student: A Tshlamo

Ethics number:

N	W	U	-	0	0	0	1	7	-	1	8	-	A	1
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Institution Study Number Year Status

Status: S = Submission; R = Re-Submission; P = Provisional

Authorisation: A = Authorisation

Application Type: Single Study

Commencement date: 2018/08/29 Risk:

Minimal

Expiry date: 2019/08/31

Approval of the study is initially provided for a year, after which continuation of the study is dependent on receipt and review of an annual (or as otherwise stipulated) monitoring report and the concomitant issuing of a letter of continuation.

Special in process conditions of the research for approval (if applicable):

- Before recruitment can begin, it is requested that the researchers please provide the HREC with a copy of the approval letter from the Ministry of Health Botswana, indicating that the study can proceed.
- Please also provide the HREC with copies of the goodwill permission letters from the CEOs of the different hospitals to be included, as well as the heads of department (medical wards, surgical wards, orthopaedic wards, spinals unit, infection control unit, wound care unit, operating theatre, oncology ward and intensive care unit), granting access to the aforementioned facilities.

1

General conditions:

While this ethics approval is subject to all declarations, undertakings and agreements incorporated and signed in the application form, the following general terms and conditions will apply:

- The study leader/supervisor (principal investigator)/researcher must report in the prescribed format to the NWU-HREC:
 - annually (or as otherwise requested) on the monitoring of the study, whereby a letter of continuation will be provided, and upon completion of the study; and
 - without any delay in case of any adverse event or incident (or any matter that interrupts sound ethical principles) during the course of the study.
- The approval applies strictly to the proposal as stipulated in the application form. Should any amendments to the proposal be deemed necessary during the course of the study, the study leader/researcher must apply for approval of these amendments at the NWU-HREC, prior to implementation. Should there be any deviations from the study proposal without the necessary approval of such amendments, the ethics approval is immediately and automatically forfeited.
- Annually a number of studies may be randomly selected for an external audit.
- The date of approval indicates the first date that the study may be started.
- In the interest of ethical responsibility the NWU-RERC and NWU-HREC reserves the right to:
 - request access to any information or data at any time during the course or after completion of the study;
 - to ask further questions, seek additional information, require further modification or monitor the conduct of your research or the informed consent process;
 - withdraw or postpone approval if:
 - any unethical principles or practices of the study are revealed or suspected;
 - it becomes apparent that any relevant information was withheld from the NWU-HREC or that information has been false or misrepresented;
 - submission of the annual (or otherwise stipulated) monitoring report, the required amendments, or reporting of adverse events or incidents was not done in a timely manner and accurately; and / or
 - new institutional rules, national legislation or international conventions deem it necessary.
- NWU-HREC can be contacted for further information or any report templates via Ethics-HRECApply@nwu.ac.za or 018 299 1206.

The NWU-HREC would like to remain at your service as scientist and researcher, and wishes you well with your study. Please do not hesitate to contact the NWU-HREC or the NWU-RERC for any further enquiries or requests for assistance.

Yours sincerely



Digitally signed by Wayne
Towers
Date: 2018.12.04
18:56:40 +02'00'

Prof Wayne Towers
Chair NWU Health Research Ethics Committee

Current details: (22011932) 01 000718022 Monitoring and Reporting Cluster/Ethics/Certified Templates/Research Ethics Approval Letters/1.5.4.2 HREC Ethical Approval
Letter design
3 December 2018
File reference: 9.1.5.4.2

APPENDIX B: APPROVAL FROM MINISTRY OF HEALTH AND WELLNESS BOTSWANA

PRIVATE BAG 0038
GABORONE
BOTSWANA
REFERENCE:



REPUBLIC OF BOTSWANA

MINISTRY OF HEALTH AND WELLNESS

TEL: (+267) 363 2500
FAX: (+267) 391 0647
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD

REFERENCE NO: HPDME 13/18/1

19 October 2018

Health Research and Development Division

Notification of IRB Review: **New application**

Akanyang Tshiamo
P O Box 501661
Gaborone

Dear Akanyang Tshiamo

Protocol Title: **NURSES' KNOWLEDGE OF AND ATTITUDE TO PRESSURE
ULCER PREVENTION AND THE BARRIERS THEY
ENCOUNTER IN TWO REFERRAL HOSPITALS IN
BOTSWANA**

HRU Approval Date:	19 October 2018
HRU Expiration Date:	18 October 2019
HRU Review Type:	Expedited Review
HRU Review Determination:	Approved
Risk Determination:	Minimal risk

Thank you for submitting new application for the above referenced protocol. The permission is granted to conduct the study.

This permit does not however give you authority to collect data from the selected sites without prior approval from the management. Consent from the identified individuals should be obtained at all times.

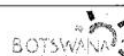
The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health and Wellness within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review

Vision: *A Healthy Nation by 2036.*

Values: *Botho, Equity, Timeliness, Customer Focus, Teamwork, Accountability*



In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the protocol's expiration date. The Continuing Review Form can be obtained from the Health Research Division Office (HRDD), Office No. 7A.7 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomoiso Motlhanka, e-mail address: kgmmotlhanka@gov.bw As a courtesy, the HRDD will send you a reminder email about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Report form

Amendments

During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDC approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from the Health Research Division Office (HRDD), Office No. 7A 7 or Ministry of Health website: www.moh.gov.bw or can be requested via e- mail from Mr. Kgomoiso Motlhanka, e-mail address: kgmmotlhanka@gov.bw . In addition submit three copies of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

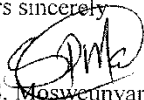
Reporting

Other events which must be reported promptly in writing to the HRDC include:

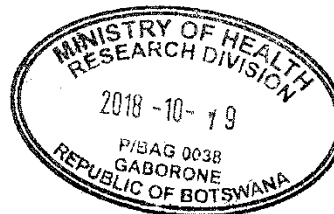
- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

If you have any questions please do not hesitate to contact Mr. K. Motlhanka at kgmmotlhanka@gov.bw, Tel +267-3632751. Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours sincerely

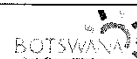


Ms S. Mosweunyane
for **/PERMANENT SECRETARY**



Vision: A Healthy Nation by 2036.

Values: Botho, Equity, Intelliness, Customer Focus, Teamwork, Accountability



APPENDIX C: APPROVAL FROM PMH ETHICS COMMITTEE

PLOT 1836 HOSPITAL WAY
TELEPHONE: 3621400
FAX: 3973776



RE PUBLIC OF BOTSWANA

PRINCESS MARINA HOSPITAL
P. O. BOX 258
GABORONE
BOTSWANA

REF: PMH 5/79(400-1-2019)

30 January 2019

Ms A. Tshiamo
North West University

Dear Ms Tshiamo

RE: Nurses' Knowledge of and attitude to Pressure Ulcer Prevention and the Barriers they encounter in Two Referral Hospitals in Botswana

The research and Ethics Committee (REC) of Princess Marina Hospital met and discussed your request to conduct a study with the aforementioned title in Princess Marina Hospital. Full approval has been granted.

Kindly observe the following:

1. You are expected to uphold the highest standards of ethics during your study.
2. You should seek consent at all times from people that you are using as participants.
3. You are required to seek permission from REC, before changing any aspect of your study and also inform the REC on any unforeseen circumstances including termination of this study.
4. REC will have full access to the study at any time for the purposes of auditing
5. Upon completion of your study, you are required to submit a hard and soft copy of your research report to the committee.
6. This permission is valid for a period of one year (30th January 2019 – 30th January 2020).

Thank you

Sincerely,

A handwritten signature in blue ink, appearing to read 'Gladness O. Tlhomelang'.

Gladness O. Tlhomelang
Secretary Research and Ethics Committee
For Hospital Superintendent

APPENDIX D: APPROVAL FROM NRH ETHICS COMMITTEE

TELEPHONE: 2411000 ext 180

FAX : 2416706/2419387



Republic of Botswana

NYANGABGWE HOSPITAL

PRIVATE BAG 127

FRANCISTOWN

BOTSWANA

08th November 2018

REF: NRH 1/2/17

PROPOSED STUDY TITLE STUDY: Nurses' Knowledge of Attitude to Pressure Ulcer Prevention And The Barriers They Encounter In Two Referral Hospitals In Botswana

Name of Applicant : Akanyang Tshiamo

Name of Site : Nyangabgwe Referral Hospital

The Institutional Review Board (Research & Ethics Committee) for Human Subjects Research for Nyangabgwe Hospital is pleased to inform you that the application for conducting the research at Nyangabgwe Hospital for the proposal named above was approved.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Hospital Research and Ethics Committee. In addition you are expected to submit at least one hard copy and an electronic copy of the report to the committee within three months of completion of the study. The permit will elapse on 18 October 2019.

Signed.....

Bayengemali R. Munyere

Chairperson- Research and Ethics Committee/

For Hospital Superintendent

Nyangabgwe Referral Hospital

APPENDIX E: GOODWILL PERMISSION FROM PMH HEADS OF DEPARTMENTS

TELEPHONE: 3621400

FAX: 3973776

PLOT NO. 1836



PRINCESS MARINA HOSPITAL

P. O. BOX 258

GABORONE

19TH February 2019

REF: PMH

Akanyang Tshiamo

North West University

Potchefstroom Campus

Dear sir/ madam

GOODWILL PERMISSION TO CONDUCT RESEARCH STUDY – AKANYANG TSHIAMO

Reference is made to your letter dated 11th January 2019

This serves to grant permission to you to conduct a research in the following units:

- Female Orthopedic ward
- Male Orthopedic ward
- Spinalis Unit

Thank you

Yours faithfully

A handwritten signature in dark ink, appearing to read 'B. Katai'.

B. Katai

Chief Registered Nurse

TELEPHONE: 3621400

FAX: 3973776

PLOT NO. 1836



PRINCESS MARINA HOSPITAL

P. O. BOX 258

GABORONE

19TH February 2019

REF: PMH

Akanyang Tshiamo

North West University

Potchefstroom Campus

Dear sir/ madam

GOODWILL PERMISSION TO CONDUCT RESEARCH STUDY – AKANYANG TSHIAMO

Reference is made to your letter dated 11th January 2019

This serves to grant permission to you to conduct a research in the following units:

- Female Medical ward
- Male Medical ward

Thank you

Yours faithfully

A handwritten signature in blue ink, appearing to read 'T. Makgophe'.

T. Makgophe

Nursing Superintendent

TELEPHONE: 3621400

FAX: 3973776

PLOT NO. 1836



PRINCESS MARINA HOSPITAL

P. O. BOX 258

GABORONE

19TH February 2019

REF: PMH

Akanyang Tshiamo

North West University

Potchefstroom Campus

Dear sir/ madam

GOODWILL PERMISSION TO CONDUCT RESEARCH STUDY – AKANYANG TSHIAMO

Reference is made to your letter dated 11th January 2019

This serves to grant permission to you to conduct a research in Intensive Care Unit

Thank you

Yours faithfully

A handwritten signature in black ink, appearing to read 'A. Sarefho'.

A. Sarefho

Senior Nursing Officer

TELEPHONE: 3621400

FAX: 3973776

PLOT NO. 1836



PRINCESS MARINA HOSPITAL

P. O. BOX 258

GABORONE

19TH February 2019

REF: PMH

Akanyang Tshiamo

North West University

Potchefstroom Campus

Dear sir/ madam

GOODWILL PERMISSION TO CONDUCT RESEARCH STUDY – AKANYANG TSHIAMO

Reference is made to your letter dated 11th January 2019

This serves to grant permission to you to conduct a research in the following units:

- Female Surgical ward
- Male Surgical ward
- Wound Care Unit

Thank you

Yours faithfully

A handwritten signature in blue ink, appearing to be 'M. Moremong', written over a horizontal line.

M. Moremong

Nursing Superintendent

TELEPHONE: 3621400

FAX: 3973776

PLOT NO. 1836



PRINCESS MARINA HOSPITAL

P. O. BOX 258

GABORONE

19TH February 2019

REF: PMH

Akanyang Tshiamo

North West University

Potchefstroom Campus

Dear sir/ madam

GOODWILL PERMISSION TO CONDUCT RESEARCH STUDY – AKANYANG TSHIAMO

Reference is made to your letter dated 11th January 2019

This serves to grant permission to you to conduct a research in Oncology Ward

Thank you

Yours faithfully

A handwritten signature in cursive script, appearing to read 'B. Mmapatsi'.

B. Mmapatsi

Principal Nursing Officer II

TELEPHONE: 3621400

FAX: 3973776

PLOT NO. 1836



PRINCESS MARINA HOSPITAL

P. O. BOX 258

GABORONE

19TH February 2019

REF: PMH

Akanyang Tshiamo

North West University

Potchefstroom Campus

Dear sir/ madam

GOODWILL PERMISSION TO CONDUCT RESEARCH STUDY – AKANYANG TSHIAMO

Reference is made to your letter dated 11th January 2019

This serves to grant permission to you to conduct a research in the following units:

- Operating Theatre
- Infection Prevention and control

Thank you

Yours faithfully

A handwritten signature in dark ink, appearing to read 'W. Mogokgwane'.

W. Mogokgwane

Principal Nursing Officer II

APPENDIX F: GOODWILL PERMISSION FROM NRH HEADS OF DEPARTMENTS

NYANGABGWE HOSPITAL
PRIVATE BAG 127
FRANCISTOWN



TEL: (267) 2411000
FAX: (267) 2416706

REF: NRH

19th February 2019

Akanyang Tshiamo
North-west University –
Potchefstroom Campus

Dear Sirs/Madam

GOODWILL PERMISSION TO CONDUCT RESEARCH – AKANYANG TSHIAMO

Reference is made to your later dated 11th January 2019

This serves to grant permission to you to conduct a research in the following Units:

- Adult Intensive Care Unit(ICU)
- Infection Control and Prevention
- Medicine and Operating Theatre.

I am the Coordinator in these units/Department

For more information please contact me on 74221589 and 2411202 or email to imothuti@yahoo.com.au

Thank you

Yours Faithfully

A handwritten signature in dark ink, appearing to read "A. L. Mothuti".

A. L. Mothuti
PRINCIPAL NURSING OFFICER 1

NYANGABGWE HOSPITAL
PRIVATE BAG 127
FRANCISTOWN



TEL: (267) 2411000
FAX: (267) 2416706

REF: NRH

19th February 2019

Akanyang Tshiamo
North-west University
Potchefstroom Campus

Dear Sirs/Madam

GOODWILL PERMISSION TO CONDUCT RESEARCH

Reference is made to your later dated 11th January 2019

Permission is granted to you as per your request to conduct research in Oncology ward, Wound Care and Surgical Department including Orthopaedics.

Thank you.

Yours faithfully

A handwritten signature in blue ink, appearing to be "A. Basiami", with a long horizontal stroke extending to the right.

A. Basiami
PRINCIPAL NURSING OFFICER II

APPENDIX G: INFORMED CONSENT FORM



Private Bag X1290, Potchefstroom
South Africa 2520
Tel: +2718 299-1111/2222
Fax: +2718 299-4910
Web: <http://www.nwu.ac.za>

Health Research Ethics Committee

Faculty of Health Sciences
NORTH-WEST University
(Potchefstroom Campus)

2018 -08- 2 8

HREC Stamp

INFORMED CONSENT DOCUMENTATION FOR REGISTERED NURSES FROM REFERRAL HOSPITALS IN BOTSWANA.

TITLE OF THE RESEARCH STUDY: Nurses' knowledge of and attitude to pressure ulcer prevention and the barriers they encounter in two referral hospitals in Botswana

ETHICS REFERENCE NUMBERS: NWU-00017-18-S1

PRINCIPAL INVESTIGATOR: Dr S. Scholtz

POST GRADUATE STUDENT: Akanyang Tshiamo

ADDRESS: North-West University

CONTACT NUMBER: +27 16 910 3564

You are being invited to take part in a **research study** that forms part of a Master's Degree in Nursing. Please take some time to read the information presented here, which will explain the details of this study. Please ask the researcher or person explaining the research to you any questions about any part of this study that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research is about and how you might be involved. Also, your participation is **entirely voluntary** and you are free to say no to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part now.

This study has been approved by the **Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU-00017-18-S1)** and will be conducted according to the ethical guidelines and principles of Ethics in Health Research: Principles, Processes and Structures (DoH, 2015) and other international ethical guidelines applicable to this study. It might be necessary for the research ethics committee members or other relevant people to inspect the research records.

What is this research study all about?

We plan to describe the nurses' knowledge of and attitude to pressure ulcer prevention and the barriers they encounter in two referral hospitals in Botswana.

- *This study will be conducted in two referral hospitals of Botswana and will be done by experienced health researchers trained in data collection. 300 participants will be included in this study.*
- *Why have you been invited to participate?*
- *You have been invited to be part of this research because you are knowledgeable about pressure ulcers since you work in the departments that deals with pressure ulcers and you have come across pressure ulcers during your practice. You also fit the research because you are registered nurses registered with the Botswana Nursing and Midwifery Council and currently with six months and more years of experience, working in the departments that deal with pressure ulcers so you are an expert in the field of pressure ulcers.*
- *You will unfortunately not be able to take part in this research if you are not registered with the Botswana Nursing and Midwifery council, have less than six months of clinical experience and working in the wards which rarely encounter pressure ulcers in their practice.*

What will be expected of you?

- *You will be expected to answer a self-reporting questionnaire which has 56 items. The questionnaire will take 15-20 minutes of your tea time. There is only one questionnaire to complete once and then you will be done. You are also expected not to discuss the questions or search for an answer.*

Will you gain anything from taking part in this research?

- *There will be no direct gains for you in the study.*
- *The other gains of the study is for you to identify other gaps and ideas for research concerning pressure ulcers which at the end can help the organization to develop initiatives to prevent pressure ulcers hence producing quality nursing care to the community.*

Are there risks involved in you taking part in this research and what will be done to prevent them?

- *The risks to you in this study are based in the principle of beneficence/Ratio risk, but risks will be limited by the researcher through ensuring that the participants are protected from harm or discomfort. To adhere to the principle of justice the researcher will select participants fairly and will ensure that all participants who meet the criteria of inclusion have fair and equal chance to participate in the study. To ensure anonymity the researcher will keep all participants anonymous,*

meaning their identities are a secret with regard to the participation in the study. Names will not be written on the questionnaires.

- Types of risks to the participants are risk to physical harm, loss of privacy, financial costs and loss of time. The participants will not incur physical harm as there are no experiments being done on them. The other anticipated risk is the loss of time of the participants. The researcher will abide by the agreed time to ensure that time is efficiently and effectively used. The researcher will meet the participants at their work places therefore the participants will not incur any financial burden. The information given by the participants will not be shared with anyone, except the research team members to maintain privacy.
- To maintain confidentiality the researcher is responsible to prevent all data gathered during the study from being connected to individual participants, revealed or made accessible to any other person. All information collected from the participants will be kept in a safe place, locked at the supervisor's office at North-West University, Potchefstroom Campus. The researcher will be held responsible for confidentiality of all information. All electronically stored information will be password protected and stored data will be accessible only to the North-West University research team members who are involved in this study.
- but will be limited by the researchers.
- There are more gains for you in joining this study than there are risks.

How will we protect your confidentiality and who will see your findings?

- Anonymity of your findings will be protected by the researcher. Your privacy will be respected by the researcher by locking all questionnaires in a cupboard at the researcher's room where only the researcher has access to the information and to keep all electronic information in a password protected computer where the researcher is the only one who can access it during data collection. Your results will be kept confidential by the researcher by locking all the questionnaires in a locked cupboard at the researcher's room where only the researcher has access to information and electronic data will be kept in a password protected computer and the researcher will be the only one who has access to it before handed to North-West University Statistical analysis. Then the researcher will take the questionnaire to North-West University to maintain confidentiality for analysis. Only the researchers and the North-West University research team members who are involved in this study will be able to look at your findings. Findings will be kept safe by locking hard copies in locked cupboards in the supervisor's office and for electronic data it will be password protected. Data will be stored 5 years.

What will happen with the findings or samples?

- The findings of this study will only be used for this study. The data will be stored in a locked cupboard in the supervisor's office at North-West University. It will be analysed in South Africa by North-West University Statistical Consultation.

How will you know about the results of this research?

- We will give you the results of this research when the results are ready by April 2019 through a presentation by the researcher.
- You will be informed of any new relevant findings by the researcher through presentations.

Will you be paid to take part in this study and are there any costs for you?

This study is funded by the researcher.

You will not be paid to take part in the study because the researcher will meet participants at the sites. There will be no travel expenses for the participants. No refreshment/meals will be served when answering the questionnaire. Refreshment will be served during the recruitment process.

There will thus be no costs involved for you, if you do take part in this study.

Is there anything else that you should know or do?

- You can contact Akanyang Tshiamo at +267 72247428 or at akanyangtshiamo@yahoo.com if you have any further questions or have any problems.
- You can also contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 018 299 1206 or carolien.vanzyl@nwu.ac.za if you have any concerns that were not answered about the research or if you have complaints about the research.
- You will receive a copy of this information and consent form for your own purposes.

Declaration by participant

By signing below, I agree to take part in the research study titled: **Nurses' knowledge of and attitude to pressure ulcer prevention and the barriers they encounter in two referral hospitals in Botswana.**

I declare that:

- I have read this information/it was explained to me by a trusted person in a language with which I am fluent and comfortable.
- The research was clearly explained to me.
- I have had a chance to ask questions to both the person getting the consent from me, as well as the researcher and all my questions have been answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be handled in a negative way if I do so.
- I may be asked to leave the study before it has finished, if the researcher feels it is in the best interest, or if I do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*) 20....

.....
Signature of participant

Declaration by person obtaining consent

I (*name*) declare that:

- I clearly and in detail explained the information in this document to
.....
- I did/did not use an interpreter.
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I gave him/her time to discuss it with others if he/she wished to do so.

Signed at (*place*) on (*date*) 20....

.....
Signature of person obtaining consent

Declaration by researcher

I (name) declare that:

- I explained the information in this document to
- I did not use an interpreter
- I was available should he/she want to ask any further questions.
- The informed consent was obtained by an independent person.
- I am satisfied that he/she adequately understands all aspects of the research, as described above.
- I am satisfied that he/she had time to discuss it with others if he/she wished to do so.

Signed at (place) on (date) 20....

.....
Signature of researcher

APPENDIX H: RESEARCH INVITATION



INVITATION TO PARTICIPATE IN RESEARCH

TOPIC:
Nurses' knowledge, attitude and barriers towards pressure ulcers prevention in two referral hospitals in Botswana.

PROJECT DATE: 2018

BENEFITS OF THE STUDY
Direct benefits
There are no direct benefits for participants in this study. The gains taking part in this study will be the opportunity to reflect on practice. The other gains of the study is will be to identify other gaps and ideas for research concerning pressure ulcers which at the end can help the organization to develop initiatives to prevent pressure ulcers hence producing quality nursing care to the community
Indirect benefits
The study will contribute to the body of knowledge of nursing in Botswana as those nurses who did not partake in the research will also benefit from the report, hence improving the quality of care given by the health facility. The patients will also benefit through receiving improved care. The other gains of the study is for the hospitals that will know how to focus in-service training for nurses which will equip nurses to give quality care for patients to receive better care, reduced hospitalization stay and reduced costs.

DECLINE TO PARTICIPATE/ PRIVACY
• You are free to decline to participate in the research and no penalty will be imposed on you.
• Your personal details will at no point be made available to anyone that is not part of the research team.

THE RESEARCHER
Akanyang Tshiamo is the student in this research study. She is doing Masters of Nursing Science at North-West University in South Africa. Dr Suegnët Scholtz is the Primary investigator of this research. She is a senior lecturer at North-West University, Faculty Health Sciences. This research will further draw on the expertise of other researchers with specific skills as needed.

CONTACT DETAILS
Akanyang Tshiamo
Cel: +267 72247428
Email address: akanvamtshiamo@yahoo.com
Dr Suegnët Scholtz
Tel 016 910 3564(W) Cel: 0832298654
E-mail address: Suegnët.scholtz@nwu.ac.za

COST
• You will not be paid to participate in the study because the researcher will meet you at the sites.
• There will be no travel expenses for you.
• There will thus be no costs involved for you to take part in this study.

INVITATION

You are hereby cordially invited participate in the above mentioned research by Akanyang Tshiamo from the North-West University.

WHY IS THIS RESEARCH NEEDED?
Pressure ulcers prevention is a core duties for nurses. There is no literature on pressure ulcer prevention in Botswana. The aim of research is to describe nurses' knowledge, attitude and barriers towards pressure ulcers prevention in two referral hospitals in Botswana.

WOULD THIS STUDY BE A GOOD FIT FOR ME?
This study might be a good fit for you if:

- You are registered with Botswana nursing and midwifery council
- You have six months and experience. Six months experience and more was chosen because you have exposure to pressure ulcers.
- You are working in medical wards, surgical wards, orthopaedic wards, spinal unit, infection control unit, wound care unit, operating theatre, oncology ward and intensive care unit. These wards and units were chosen because they encounter pressure ulcers in their daily nursing practice.
- Are willing to participate in the research.

WOULD THIS STUDY NOT BE A GOOD FIT FOR ME
This study will not be a good fit for you if:

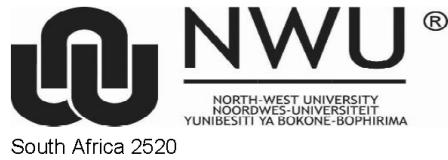
- You are a registered nurses who is not practicing,
- You are on leave during data collection.
- You are working in the paediatric wards, neonatal ward, private ward, renal care, gynaecology ward, out-patients department maternity wards and psychiatric referral hospital because they are less likely to encounter pressure ulcers in their area of practice.

WHAT WOULD HAPPEN IF I TOOK PART IN THIS STUDY
If you decide to take part in the study you will be required to do the following:

- You decide for yourself whether to participate in the study or not.
- You are given informed consent forms to study it for two days so that you can make an informed decision.
- You have the right to withdraw from the study even after signing the informed consent and nothing will be held against you.
- You can also withdraw from the study even during the research process without compulsion.
- You are expected to use 10 to 15 minutes of your tea break to sign the informed consent to take part in the study.
- You drop the signed informed consent forms in the central box at surgical out-patient department managed by a registered nurse.
- You are expected to complete a survey self-reporting questionnaire which describe nurses' knowledge, attitudes and barriers towards pressure ulcers prevention in two referral hospitals in Botswana.
- The questionnaire consists of four sections; the socio-demographic, knowledge, attitude and barriers and you are expected to answer all questions in all sections.
- You are expected not to write names on the questionnaires.
- You are not allowed to discuss the questionnaire or to search for the answers, you are expected to use the knowledge that you have.
- You are expected to complete all the questionnaires on duty and use available spaces in day room, nurses' offices, counselling rooms, conference rooms and doctors' offices in their units.
- You are not allowed to complete the questionnaire at home to avoid open book or internet search for the correct answers
- You are requested to use 15-20 minutes of your 30 minutes of tea time to complete the questionnaires
- You are expected to drop completed questionnaire in a central box at the surgical out-patient department



APPENDIX I: RESEARCH QUESTIONNAIRE



South Africa 2520

Private Bag X1290, Potchefstroom

Tel: +2718 299-1111/2222

Fax: +2718 299-4910

Web: <http://www.nwu.ac.za>

Questionnaire

Nurses' knowledge, attitude and barriers towards pressure ulcers prevention in two referral hospitals in Botswana

Section I: Socio-Demographic Information

Instruction: Please circle the number which contain your correct answer (the most appropriate answer) or in the space provided

Code	Questions	Responses
S1	Hospital code	1. Southern 2. Northern
S2	Questionnaire code	
S3	What is your sex	1. male 2. Female
S4	What are your age range	1. 18-24 2. 25-34 3. 35-50 4. > 50
S5	What is your level of education	1. diploma 2. degree 3. Masters
S6	Range of years of experience	1. 0-5 years 2. 6-10 years 3. 11-20 years 4. More than 20 years
S7	Which department are you serving	1. Male Surgical 2. Female surgical 3. Male Medical 4. Female medical 5. Male Orthopaedic 6. Female orthopaedic 7. Spinals 8. Oncology 9. ICU 10. Infection control 11. Wound care 12. Operating theatre

Section II: Knowledge assessment

Please read each statement carefully and circle the option that most likely reflects your answer to the following questions.

Theme 1: Aetiology and development

- 1. Which statement is correct?**
 - a. Malnutrition causes pressure ulcers.
 - b. A lack of oxygen causes pressure ulcers. ✓
 - c. Moisture causes pressure ulcers.
 - d. I don't know.

- 2. Why are the extremely thin patients more at risk of developing a pressure ulcer than obese patients?**
 - a. The contact area involved is small and thus the amount of pressure is higher. ✓
 - b. The pressure is less extensive because the body weight of those patients is lower than the body weight of obese patients.
 - c. The risk of developing a vascular disorder is higher for obese patients. This increases the risk of developing a pressure ulcer
 - d. I don't know.

- 3. What happens when a patient, sitting in bed in a semi-upright position (60°), slides down?**
 - a. Pressure increases when the skin sticks to the surface.
 - b. Friction increases when the skin sticks to the surface.
 - c. Shearing increases when the skin sticks to the surface. ✓
 - d. I don't know.

- 4. Which statement is correct?**
 - a. Soap can dehydrate skin thus causing pressure ulcers.
 - b. Moisture from urine, faeces, or wound drainage causes pressure ulcers.
 - c. Shear is the force which occurs when the body slides and the skin sticks to the surface. ✓
 - d. I don't know.

5. Which statement is correct?

- a. Recent weight loss which has brought a patient below his or her ideal weight increases the risk of pressure ulcers. ✓
- b. Very obese patients using medication that decreases the peripheral blood circulation are not at risk of developing pressure ulcers.
- c. Poor nutrition and age have no impact on tissue tolerance when the patient has a normal weight.
- d. I don't know.

6. Which of the following is not a contributing factor for pressure ulcer risk?

- a. Age.
 - b. Dehydration.
 - c. Hypertension. ✓
 - d. I don't know.
-

Theme 2: Classification and observation

1. Which statement is correct?

- a. A pressure ulcer extending down to the fascia is a grade 3 pressure ulcer. ✓
- b. A pressure ulcer extending through the underlying fascia is a grade 3 pressure ulcer.
- c. A grade 3 pressure ulcer is always preceded by a grade 2 pressure ulcer.
- d. I don't know.

2. Which statement is correct?

- a. A blister on a patient's heel is always a pressure ulcer of grade 2.
- b. All grades (1, 2, 3, and 4) of pressure ulcers involve loss of skin layers.
- c. When necrosis occurs, it is a grade 3 or a grade 4 pressure ulcer. ✓
- d. I don't know.

3. Which statement is correct?

- a. Friction or shear may occur when moving a patient in bed. ✓
- b. A superficial lesion, preceded by non-blanchable erythema is probably a friction lesion.
- c. A kissing ulcer (copy lesion) is caused by pressure and shear.
- d. I don't know.

4. In a sitting position, pressure ulcers are most likely to develop on:

- a. Pelvic area, elbow and heel.✓
- b. Knee, ankle and hip.
- c. Hip, shoulder and heel.
- d. I don't know.

5. Which statement is correct?

- a. All patients at risk of pressure ulcers should have a systematic skin inspection once a week.
 - b. The skin of patients seated in a chair, who cannot move themselves, should be inspected every two to three hours.
 - c. The heels of patients who lie on a pressure redistributing surface should be observed minimum once a day.✓
 - d. I don't know.
-

Theme 3: Risk assessment

1. Which statement is correct?

- a. Risk assessment tool identify all high risk patients in need of prevention.
- b. The use of risk assessment scales reduces the cost of prevention.
- c. A risk assessment scale may not accurately predict the risk of developing a pressure ulcer and should be combined with clinical judgement.✓
- d. I don't know.

2. Which statement is correct?

- a. The risk of pressure ulcer development should be assessed daily in all in patients.
 - b. Absorbing pads should be placed under the patient to minimize the risk of pressure ulcer development.
 - c. A patient with history of pressure ulcers has a higher risk of developing new pressure ulcers.✓
 - d. I don't know.
-

Theme 4: Nutrition

1. Which statement is correct?

- a. Malnutrition causes pressure ulcers.
- b. The use of nutritional supplements can replace expensive preventive measures.

- c. Optimizing nutrition can improve the patients' general physical condition which may contribute to a reduction of the risk of pressure ulcers. ✓
 - d. I don't know.
-

Theme 5: Preventive measures to reduce the amount of pressure/shear

1. The sitting position with the lowest contact pressure between the body and the seat is:

- a. An upright sitting position, with both feet resting on a footrest.
- b. An upright sitting position, with both feet resting on the floor.
- c. A backwards sitting position, with both legs resting on a footrest. ✓
- d. I don't know.

2. Which repositioning scheme reduces pressure ulcer risk the most?

- a. Supine position - side 90° lateral position - supine position - 90° lateral position – supine position.
- b. Supine position – side 30° lateral position – side 30° lateral position – supine position. ✓
- c. Supine position – side 30° lateral position – sitting position - 30° lateral position – supine position.
- d. I don't know

3. Which statement is correct?

- a. Patient who are able to change positions while sitting should be taught to shift their weight minimum every 60 minutes while sitting in a chair ✓
- b. In a side laying position, the patient should be at a 90° angle with the bed.
- c. Shearing forces affect a patient's sacrum maximally when the head of the bed is positioned at a 30°.
- d. I don't know.

4. If a patient is sliding down in a chair, the magnitude of pressure at the seat can be reduced the most by:

- a. A thick air cushion. ✓
- b. A donut shaped foam cushion.
- c. A gel cushion.
- d. I don't know.

For a patient at risk of developing a pressure ulcer, a visco-elastic foam mattress...

- a. Reduces the pressure sufficiently and does not need to be combined with repositioning.
- b. Has to be combined with repositioning every 2 hours.
- c. Has to be combined with repositioning every 4 hours.✓
- d. I don't know.

5. A disadvantage of a water mattress is:

- a. Shear at the buttocks increases.
- b. Pressure at the heels increases.
- c. Spontaneous small body movement are reduced.✓
- d. I don't know.

6. When a patient is lying on a pressure reducing foam mattress...

- a. Elevation of the heels is not necessary.
 - b. Elevation of the heels is important.✓
 - c. He or she should be checked for "bottoming out" at least twice a day.
 - d. I don't know.
-

Theme 6: Preventive measures to reduce the duration of pressure/shear

1. Repositioning is an accurate preventive method because...

- a. The magnitude of pressure and shear will be reduced.
- b. The amount and the duration of pressure and shear will be reduced.
- c. The duration of pressure and shear will be reduced.✓
- d. I don't know.

2. Fewer patients will develop a pressure ulcer if...

- a. Foods supplements are provided.
- b. The areas at risk are massaged.
- c. Patients are mobilized.✓
- d. I don't know.

Which statement is correct?

- a. Patients at risk lying on a non-pressure reducing foam mattress should be repositioned every 2 hours. ✓
- b. Patients at risk lying on an alternating air mattress should be repositioned every 4 hours.
- c. Patients at risk lying on a visco- elastic foam mattress should be repositioned every 2 hours.
- d. I don't know.

3. When a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcer includes:

- a. No specific preventive measures.
- b. A pressure reducing cushion under the heels.
- c. A cushion under the lower legs elevating the heels. ✓
- d. I don't know.

4. If a bedridden patient cannot be repositioned, the most appropriate pressure ulcer prevention is:

- a. A pressure redistributing foam mattress.
- b. An alternating pressure air mattress. ✓
- c. Local treatment of the risk areas with zinc oxide paste.
- d. I don't know.

Section III: Attitude assessment

Please read each statement carefully and tick the mark sign "✓" in the corresponding column that most likely reflects your answer to the following questions.

Code		Strongly agree	Agree	Disagree	Strongly disagree
F1	Personal competency to prevent pressure ulcers				
F1.1(+)	I feel confident in my ability to prevent pressure ulcers.				
F1.2(+)	I am well trained to prevent pressure ulcers.				
f.1.3(-)	Pressure ulcer prevention is too difficult. Others are better than I am.				
F2	Priority of pressure ulcer prevention				

F2.1(-)	Too much attention goes to the prevention of pressure ulcers.				
F2.2(-)	Pressure ulcer prevention is not that important.				
F2.3(+)	Pressure ulcer prevention should be a priority.				
F3	Impact of pressure ulcers				
F3.1(-)	A pressure ulcer almost never causes discomfort for a patient.				
F3.2(+)	The financial impact of pressure ulcers on society is high.				
F4	Responsibility in pressure ulcer prevention				
F4.1(-)	I am not responsible if a pressure ulcer develops in my patients.				
F4.2(+)	I have an important task in pressure ulcer prevention.				
F5	Confidence in the effectiveness of prevention				
F5.1(+)	Pressure ulcers are preventable in high risk patients.				
F5.2(-)	Pressure ulcers are almost never preventable.				

Section IV: Barriers/ challenges assessment

What are the challenges or barriers that hinder you from proper prevention of pressure ulcers? Please put the tick mark "√" in the corresponding column.

Code		Yes	No
C1	Poor access to literature about pressure ulcers by nurses.		
C2	Heavy work load and lack of adequate staffing.		
C3	Lack of universal guidelines on prevention of pressure ulcers.		
C4	Inadequate coverage about pressure ulcers during training.		
C5	Uncooperative patients.		
C6	Lack of job satisfaction in nursing profession.		
C7	Lack of time.		
C8	Presence of other priorities than pressure ulcers.		

C9	Shortage of pressure relieving devices on my unit/ equipment used for pressure ulcer care		
C10	Inadequate knowledge about pressure ulcers among nurses.		
C11	Lack of multidisciplinary/ uncooperative among staff nurses		
C12	Others (please specify)		
C13	I don't have any challenge		

APPENDIX J: ORIGINAL DEMOGRAPHIC QUESTIONNAIRE FROM ETAFa

NB: This tool is original that I used during my study. Don't hesitate to use it.

Appendix – C English version questionnaires

Addis Ababa University College Of Health Sciences Allied School Of Nursing And Midwifery
Department Of Nursing And Midwifery

Questionnaires

S/no	Questions	Responses	Code
101	Questionnaire code	_____	S1
102	Name of Hospital	_____	S2
103	What is your sex?	1. Male 2. Female	S3
104	How old are you?	_____ (in years)	S4
105	What is your marital status?	1. Single 2. Married 3. Widowed 4. Divorced	S5
106	What is your level of education?	1. Diploma in nursing 2. Degree in nursing 3. Masters in nursing	S6
107	What is your total monthly income?	_____ (birr)	S7
108	How long is your experience in nursing profession?	_____ (in years)	S8
109	Which area of ward are you currently serving in currently?	1. Adult Medical ward 2. Adult Surgical ward 3. ICU 4. Pediatric ward 5. Gynecology ward	S9



I earned my MSc in child health nursing from Addis Ababa University. But, assigned to Seimara University to my study program. Contact me for further info.

APPENDIX K: ORIGINAL KNOWLEDGE ASSEMENT QUESTIONNAIRE FROM BEECKMAN

Theme 1: Aetiology and development

- Which statement is correct?
 - Malnutrition causes pressure ulcers.
 - A lack of oxygen causes pressure ulcers.*
 - Moisture causes pressure ulcers.
- Extremely thin patients are more at risk of developing a pressure ulcer than obese patients.
 - Correct. The contact area involved is small and thus the amount of pressure is higher.*
 - Incorrect. The pressure is less extensive because the body weight of those patients is lower than the body weight of obese patients.
 - Incorrect. The risk of developing a vascular disorder is higher for obese patients. This increases the risk of developing a pressure ulcer.
- What happens when a patient, sitting in bed in a semi-upright position (55°), slides down?
 - Pressure increases when the skin sticks to the surface.
 - Friction increases when the skin sticks to the surface.*
 - Shearing increases when the skin sticks to the surface.*
- Which statement is correct?
 - Soap can dehydrate skin and thus the risk of pressure ulcers is increased.
 - Moisture from urine, faeces, or wound drainage causes pressure ulcers.
 - Shear is the force which occurs when the body slides and the skin sticks to the surface.*
- Which statement is correct?
 - Recent weight loss which has brought a patient below his or her ideal weight, increases the risk of pressure ulcers.*
 - Very obese patients using medication that decreases the peripheral blood circulation are not at risk of developing pressure ulcers.
 - Poor nutrition and age have no impact on tissue tolerance when the patient has a normal weight.
- There is NO relationship between pressure ulcer risk and:
 - Age
 - Dehydration
 - Hypertension*

Theme 2: Classification and observation

- Which statement is correct?
 - A pressure ulcer extending down to the fascia is a grade 3 pressure ulcer.*
 - A pressure ulcer extending through the underlying fascia is a grade 3 pressure ulcer.
 - A grade 3 pressure ulcer is always preceded by a grade 2 pressure ulcer.
- Which statement is correct?
 - A blister on a patient's heel is always a pressure ulcer of grade 2.
 - All grades (1, 2, 3, and 4) of pressure ulcers involve loss of skin layers.
 - When necrosis occurs, it is a grade 3 or a grade 4 pressure ulcer.*
- Which statement is correct?
 - Friction or shear may occur when moving a patient in bed.*
 - A superficial lesion, preceded by non-blanchable erythema is probably a friction lesion.
 - A moving ulcer (body heeling) is caused by pressure and shear.
- In a sitting position, pressure ulcers are most likely to develop on:
 - Pelvic area, elbow and heel.*
 - Knee, ankle and hip.
 - Hip, shoulder and heel.
- Which statement is correct?
 - All patients at risk of pressure ulcers should have a systematic skin inspection once a week.
 - The skin of patients seated in a chair, who cannot move themselves, should be inspected every two to three hours.
 - The heels of patients who lie on a pressure redistributing surface should be observed minimum a day.*

Theme 3: Risk assessment

- Which statement is correct?
 - Risk assessment tools identify all high risk patients in need of prevention.
 - The use of risk assessment scales reduces the cost of prevention.
 - A risk assessment scale may not accurately predict the risk of developing a pressure ulcer and should be combined with clinical judgement.*
- Which statement is correct?
 - The risk of pressure ulcer development should be assessed daily in all nursing home patients.
 - Absorbing pads should be placed under the patient to minimize the risk of pressure ulcer development.
 - A patient with a history of pressure ulcers runs a higher risk of developing new pressure ulcers.*

Theme 4: Nutrition

1. Which statement is correct?
 - a. Malnutrition causes pressure ulcers.
 - b. The use of nutritional supplements can replace expensive preventive measures.
 - c. Optimizing nutrition can improve the patients general physical condition which may contribute to a reduction of the risk of pressure ulcers.*

Theme 5: Preventive measures to reduce the amount of pressure/shear

1. The sitting position with the lowest contact pressure between the body and the seat is:
 - a. An upright sitting position, with both feet resting on a footrest.
 - b. An upright sitting position, with both feet resting on the floor.
 - c. A backwards sitting position, with both legs resting on a footrest.*
2. Which repositioning scheme reduces pressure ulcer risk the most?
 - a. Supine position - side 90° lateral position - supine position - 90° lateral position - supine position - ...
 - b. Supine position - side 30° lateral position - side 30° lateral position - supine position - ...*
 - c. Supine position - side 30° lateral position - sitting position - 30° lateral position - supine position - ...
3. Which statement is correct?
 - a. Patients who are able to change position while sitting should be taught to shift their weight minimum every 60 minutes while sitting in a chair.*
 - b. In a side lying position, the patient should be at a 90 degree angle with the bed.
 - c. Shearing forces affect a patients sacrum maximally when the head of the bed is positioned at 30°.
4. If a patient is sliding down in a chair, the magnitude of pressure at the seat can be reduced the most by:
 - a. A thick air cushion*
 - b. A donut shaped foam cushion
 - c. A gel cushion
5. For a patient at risk of developing a pressure ulcer, a visco-elastic foam mattress...
 - a. Reduces the pressure sufficiently and does not need to be combined with repositioning.
 - b. Has to be combined with repositioning every 2 hours.
 - c. Has to be combined with repositioning every 4 hours.*
6. A disadvantage of a water mattress is:
 - a. Shear at the buttocks increases.
 - b. Pressure at the heels increases.
 - c. Spontaneous small body movements are reduced.*
7. When a patient is lying on a pressure reducing foam mattress...
 - a. Elevation of the heels is not necessary.
 - b. Elevation of the heels is important.*
 - c. He or she should be checked for "bottoming out" at least twice a day.

Theme 6: Preventive measures to reduce the duration of pressure/shear

1. Repositioning is an accurate preventive method because...
 - a. The magnitude of pressure and shear will be reduced.
 - b. The amount and the duration of pressure and shear will be reduced.
 - c. The duration of pressure and shear will be reduced.*
2. Fewer patients will develop a pressure ulcer if ...
 - a. Food supplements are provided.
 - b. The areas at risk are massaged.
 - c. Patients are mobilized.*
3. Which statement is correct?
 - a. Patient's at risk lying on a non pressure reducing foam mattress should be repositioned every two hours.
 - b. Patient's at risk lying on an alternating air mattress should be repositioned every 4 hours.
 - c. Patient's at risk lying on a visco-elastic foam mattress should be repositioned every 2 hours.
4. When a patient is lying on an alternating pressure air mattress, the prevention of heel pressure ulcers includes:
 - a. No specific preventive measures.
 - b. A pressure reducing cushion under the heels.
 - c. A cushion under the lower legs elevating the heels.*
5. If a bedridden patient cannot be repositioned, the most appropriate pressure ulcer prevention is:
 - a. A pressure redistributing foam mattress.
 - b. An alternating pressure air mattress.*
 - c. Local treatment of the risk areas with zinc oxide paste.

APPENDIX L: ORIGINAL ATTITUDE QUESTIONNAIRE FROM BEECKMAN

Table 5

Final version of the Attitude towards Pressure ulcer Prevention instrument (APuP) (maximum score = 52).

	Strongly agree	Agree	Disagree	Strongly disagree
F1. Personal competency to prevent pressure ulcers (three items) (maximum score = 12)				
F1.1. (+) ^a I feel confident in my ability to prevent pressure ulcers.	0	0	0	0
F1.2. (+) ^a I am well trained to prevent pressure ulcers.	0	0	0	0
F1.3. (-) ^b Pressure ulcer prevention is too difficult. Others are better than I am.	0	0	0	0
F2. Priority of pressure ulcer prevention (three items) (maximum score = 12)				
F2.1. (-) ^b Too much attention goes to the prevention of pressure ulcers.	0	0	0	0
F2.2. (-) ^b Pressure ulcer prevention is not that important.	0	0	0	0
F2.3. (+) ^a Pressure ulcer prevention should be a priority.	0	0	0	0
F3. Impact of pressure ulcers (three items) (maximum score = 12)				
F3.1. (-) ^b A pressure ulcer almost never causes discomfort for a patient.	0	0	0	0
F3.2. (-) ^b The financial impact of pressure ulcers on a patient should not be exaggerated.	0	0	0	0
F3.3. (+) ^a The financial impact of pressure ulcers on society is high.	0	0	0	0
F4. Responsibility in pressure ulcer prevention (two items) (maximum score = 8)				
F4.1. (-) ^b I am not responsible if a pressure ulcer develops in my patients.	0	0	0	0
F4.2. (+) ^a I have an important task in pressure ulcer prevention.	0	0	0	0
F5. Confidence in the effectiveness of prevention (two items) (maximum score = 8)				
F5.1. (+) ^a Pressure ulcers are preventable in high risk patients.	0	0	0	0
F5.2. (-) ^b Pressure ulcers are almost never preventable.	0	0	0	0

^a Positively worded item.

^b Negatively worded item.

APPENDIX M: ORIGINAL BARRIERS INSTRUMENT FROM ETAFA

Section V): What are the challenges that hinder you from proper prevention of pressure ulcer? Please put the tick mark "✓" in the corresponding column

	YES	NO
1) Poor access to literature about pressure ulcer by nurses.		
2) Heavy work load and lack of adequate staffing/ lack of time/		
3) Lack of universal guidelines on prevention of pressure ulcers		
4) Inadequate coverage about pressure ulcers during training		
5) Uncooperative patients		
6) Lack of job satisfaction in nursing profession		
7) Lack of time		
8) Presence of other priorities other than pressure ulcers		
9) Shortage of pressure relieving devices on my unit/equipment used for PUP care		
10) Inadequate knowledge about pressure ulcers among nurses		

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11) Lack of multidisciplinary/ uncooperative among staff nurses		
12) Others, (please specify) _____		
13) I don't have any challenge.		

Thank you for your voluntary participation!

APPENDIX N: LETTER OF PERMISSION TO USE QUESTIONNAIRE FROM BEECKMAN

RE: REQUEST TO USE YOUR INSTRUMENTS FOR PRESSURE ULCER PREVENTION

Yahoo/Inbox

Dimitri Beeckman <dimitri.beeckman@ugent.be>

To: akanyang tshiamo

Tue, Aug 15, 2017 at 10:18 AM

Dear

I am pleased to provide permission to use the instruments.

Good luck.

Met vriendelijke groeten

Dimitri Beeckman

Prof. dr. Dimitri Beeckman

Professor of Skin Integrity and Clinical Nursing

Visiting Professor, University of Surrey (Guildford, UK)

Visiting Professor, Royal College of Surgeons in Ireland (Dublin, Ireland)

Vakgroep Maatschappelijke Gezondheidskunde, Universitair Centrum voor Verpleegkunde en Vroedkunde

Skin Integrity Research Group (SKINT)

UZ SK3, De Pintelaan 185 | B - 9000 Gent, België

Tel: +32 (0) 9 332 83 46 | Secretariaat: +32 (0) 9 332 83 92

Mail: Dimitri.Beeckman@UGent.be | Mail Secretariaat: UCVV@UGent.be

URL: <http://www.UCVV.Gent.be> | Twitter: [@UCVVGent](https://twitter.com/UCVVGent), [@DimitriBeeckman](https://twitter.com/DimitriBeeckman)

Neem een kijkje in onze [nieuwsbrief](#). Blijf je graag op de hoogte van de UCVV activiteiten, registreer [hier](#)!

APPENDIX O: DECLARATION OF LANGUAGE EDITOR

Dr Eddie Bain
D. Litt et Phil (UNISA)
SATI Membership No: 1002582

93 Republic Street
Baillie Park
Potchefstroom
2531
Mobile: 0824905009
Email: eddie.e.bain@gmail.com

Dear Ms Tshiamo

This serves to confirm that your dissertation has been submitted to me for language editing. The in-text edits have been made in Track Changes. While I have suggested a limited number of changes in the margin of the script, I cannot guarantee that these have been implemented, nor can I take responsibility for any other subsequent changes that may have been made.

Yours sincerely

Eddie Bain

3 December 2020