EFFECT OF AN EDUCATIONAL PROGRAMME ON NURSES' KNOWLEDGE AND PRACTICE OF PRESSURE ULCER PREVENTION STRATEGIES IN SELECTED TEACHING HOSPITALS IN SOUTH-WESTERN NIGERIA

BY

Rose Ekama Ilesanmi:

RN, IIWCC (Stellenbosch) BSc, MSc(IB)

(Matriculation Number 81499)

A Thesis in the Department of Nursing,

Submitted to the Faculty of Clinical Sciences

in Partial Fulfilment of the Requirement for Degree of

DOCTOR OF PHILOSOPHY

of the

UNIVERSITY OF IBADAN

January, 2014.

ABSTRACT

Prevention of Pressure Ulcer (PU) is a nursing responsibility and reflects the quality of nursing care. The role of evidence-based Educational Intervention Programme (EIP) among nurses towards its prevention has been differently reported in the literature. However, the possible effects of EIP on PU prevention among nurses in Nigeria have not been adequately explored. This study was aimed at evaluating the effects of an EIP on knowledge and practice of PU prevention among nurses in selected teaching hospitals in Nigeria.

A quasi-experimental study was conducted in three of the six teaching hospitals in south-western Nigeria: Lagos State University Teaching Hospital (LASUTH), University College Hospital (UCH) and Obafemi Awolowo Teaching Hospital Complex (OAUTHC). These hospitals were selected through balloting and labeled as Intervention Group (IG)-LASUTH and UCH; and Control (OAUTHC). All 193 nurses (127 in IG and 66 in control group) from the purposively selected wards in neurological, orthopedics and medical units in each hospital were recruited. Participants received a 5-day EIP of five modules focusing on PU risk assessment and preventive interventions with hands-on training. Baseline, immediate post-EIP and 3-month post-EIP knowledge of PU prevention strategies were evaluated using a standardised Pressure Ulcer Knowledge Test (PUKT). Practice was assessed using a validated observational checklist (Risk-based Prevention Intervention Checklist) at baseline and 3-month post-EIP. During the 3-month period, consumables for skin care and prevention of friction were also provided for use on the skin of patients at risk for PU in the IG and control group. Paired t, Mann-Whitney U and Wilcoxon Sign tests were used for data analyses.

There were no significant differences in the mean ages of participants [IG: 36.3±10.4 years; control: 35.2±11.9 years] $p<0.05$, and mean years of experience [IG: 14.5 ±13.7 years; control: 12.6 ±12.0 years] $p<0.05$. The mean knowledge scores increased significantly among IG from 32.5 ±4.2 at baseline to 40.7 ±3.4 ($p<0.05$) at immediate post- EIP while in the control group it increased from 30.8± 5.0 to 31.2 ±5.2. At 3-month post-EIP, the mean score increased significantly in both groups; from 40.7±3.4 to 42.0 ± 4.0 in the IG and 31.2±5.2 to 37.8 ± 5.6 in the control group. The increased mean knowledge scores from baseline to immediate post-EIP among IG (8.2 ±5.4) was significantly higher than that of the control group (0.4 ±2.2); ($p < 0.05$). The increased mean knowledge scores from immediate post-EIP to 3-month post-EIP among IG (2.0 ±5.5) was not significantly different from the control (6.2 ±7.2). The median rank for practice in both IG and control groups were equal (97.0) at baseline and it increased to 105.0 only in the IG at 3months ($p<0.05$). However, in the control group the median rank decreased to 87.5 at 3-month post-EIP ($p<0.05$).

Educational Intervention Programme improved nurses' knowledge of pressure ulcer prevention and practice. There is the need to improve on existing nursing continuing education programmes on evidence-based educational intervention for pressure ulcer prevention.

Keywords: Pressure ulcer, Educational intervention program, Quality of nursing practice.

Word count: 481

ACKNOWLEDGEMENTS

I am so grateful to many people who have helped me to finish this thesis, for without their support and love this work would have been difficult.

I was privileged to have two excellent supervisors with complementing competencies. I will like to express my sincere gratitude to Dr Bola Abosede Ofi for her excellent guidance, inspiration and support. Ma, you have shared your expertise and your desire to bridge the gap between theory and practice. Thank you for allocating resources for this work and providing me with generous working conditions in terms of information sharing through very useful literature to enrich the work. You also took the trouble of coming to the field to see how I was doing and to share your expertise. I am indeed very grateful.

Prof. O. M. Oluwatosin, thank you for accepting to supervise this work and to share your expertise in wound care. You recognized the need for me to have a specialized training in wound care and also introduced me to the course in the University of Stellenbosch, South Africa. I am greatly indebted to you for this exposure which added quality to my work. I thank you for your patience in critiquing the evidence-based protocol for pressure ulcer prevention and for giving me constructive advice and support. Your questions have always started a process of reflection and re-thinking.

I appreciate the Acting Head of Department, Dr F.A. Okanlawon for all his support and encouragement towards the completion of this work. I am also grateful to the immediate past acting Head of department, Dr Adenike Onibokun , for her support and encouragement.

I also appreciate the entire Faculty of Nursing, University of Ibadan, whose contributions and support cannot be over-emphasized.

Dr Abimbola Oluwatosin, (Aunty Bimbo), I cannot but thank you in a special way, though you are part of the Faculty of Nursing. You have been my friend and teacher as an undergraduate student and I cannot forget your kind words and encouragement. Thank you for your love, goodwill and prayers over the years.

Dr Prisca Olabisi Adejumo, I chose you as my sister, friend and mentor. Thank you for your unwavering support and friendship over the years and your enthusiasm for my success in this doctoral adventure. I also appreciate your husband, Dr Adebayo Adejumo for his messages of encouragement.

My dear Joy Adejumo, you made the field work experience appear as though we were on a picnic. Mr. Olumide Adetono, my computer expert, I remember those times when I had to call you on phone late at night to provide instructions on how to settle some knotty issues on the computer. Your guidance helped to bring this work to this level. Thank you so much.

I will like to express my earnest appreciation to my colleagues and teachers in Wound Care at the University of Stellenbosch, South Africa: Hiske Smart and Elizabeth Ayello. My meeting with you in the International Interdisciplinary Wound Care Course (IIWCC), University of Stellenbosch was indeed a blessing. The knowledge and the resources you shared were huge support to my work. Thank you Elizabeth for providing me with the complete instrument (Pressure Ulcer Knowledge Test) for this study. I am so grateful and indebted to 3M Wound Care Company for providing me with the consumables for skin care which I used for this study. Your support enhanced the achievement of the goals.

My dear friend and statistician, Dr Angela Chukwu, thank you for your support in the data analysis. Dr T. K. Hamzat, Thank you for your support in reviewing the abstract and shortening the process of title registration. I sincerely appreciate the love and support of my family, my mum and my siblings for all their prayers and encouragement throughout this adventure. My Daddy, Elder Bakare, I am greatly indebted to you. My lovely daughters, Lavern, Faith, Rachel, and Ibukunoluwa, I am grateful for your sacrifices and love, even when I could not give you adequate time and attention you required. Lavern, I sincerely appreciate your immense contribution during the months of my fieldwork.

I am indebted to my brother in-law, Oluwole Ilesanmi, for making it possible for me to use the resources of the school's library, University of Wyoming, United States of America to boost my literature review. To the participants in the three hospitals, I thank you very much for your cooperation.

I could not have made it through without the love and support of my dear friend and husband, Prof. Abiodun O. Ilesanmi (OON), the *Osi- Balogun Baasegun of Ibadanland, Otunba of Ijesaland*, whose many prayers and words of encouragement have made this adventure very much lighter. I appreciate your sacrifices of many months while I completed my education. Thank you very much for your kind words and your absolute faith in my ability to succeed. I sincerely appreciate your invaluable support even when I had to take courses abroad to facilitate this work. *'Konitan mbe.'*

My Pastors in Treasured Life Family Church, thank you for your prayers. To all others too numerous to mention who supported me in so many ways, I am very grateful.

Finally, I owe my deepest gratitude to the Most High God, the author and the finisher of my faith, for the tender mercies I have enjoyed. Psalm 28 Vs 7 says '*The Lord is my strength and my shield; my heart trusted in Him and I am helped; therefore my heart greatly rejoiceth and with my song will I praise Him'.* I am what I am today by your mercy and grace. Father, I thank you.

CERTIFICATION

I certify that this work was carried out by Rose Ekama Ilesanmi, in the Department of Nursing, University of Ibadan.

Dr Bola A. Ofi ***RN, PhD.***
Senior Lecturer
Department of Nursing
University of Ibadan

Prof. O. M Oluwatosin
Department of Surgery
University of Ibadan

DEDICATION

This work is dedicated to the Glory of God

And

To NURSING PROFESSION

Towards the maintenance of skin integrity in mobility compromised patients

And all clients at risk for impaired skin integrity.

TABLE OF CONTENTS

CHAPTER SIX:

SUMMARY AND CONCLUSION

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

Preventing pressure ulcer (PU) has been for many years a nursing concern. This is evident in Florence Nightingale's book '*Notes in Nursing*' in 1859 where she made the statement '…If *he has a bedsore, it's generally not the fault of the disease, but of the nursing"* (Nightingale 1859, p8.). Lyder and Ayello (2008) reported that some authors view pressure ulcer as a "*visible mark of caregiver sin"* which is associated with poor or nonexistent nursing care, suggesting that pressure ulcer is a significant indicator of the quality of nursing care. Other clinicians believe that pressure ulcer development is not simply the fault of nursing care, but rather a failure of the entire heath care system, indicating a breakdown in the cooperation and skill of the entire health care team; nurses, physicians, physical therapists, dietitians, among others (Lyder, Grady & Mathur et al (2004) in Lyder & Ayello, 2008). This imply that pressure ulcer can be prevented if appropriate interventions are put in place within the context of team work and interdisciplinary approach.

PU was defined as localized injury to the skin and/or underlying tissue usually over a bony prominence (e.g., the sacrum, trochanter, ischium, or heel), as a result of pressure, or pressure in combination with shear and/or friction (Wounds Ostomy and Continence Nursing (WOCN) 2006) This definition was later revised by the combined PU advisory panels: National pressure ulcer Advisory panel and European Pressure Ulcer Advisory Panel as localized injury to the skin and/or underlying tissue usually over a bony prominence, as a result of pressure, or pressure in combination with shear. A number of contributing or confounding factors are also associated with pressure ulcers; the significance of these factors is yet to be elucidated (NPUAP-EPUAP 2009). This current definition emphasizes pressure, with/without shear as major denominators in PU development. Less emphasis is however placed on the effect of friction. The argument therefore from other authorities in respect of this revised definition is that friction generates shear and when friction is high, the shear is also high. Therefore inclusion of shear presumes the presence of friction (WOCN 2010), suggesting that inclusion of friction in the definition would not be an error.

PU is found to be common among the elderly and mobility compromised patients, and also a potentially preventable condition which constitutes a major cause of morbidity and prolonged hospital stay. According to Erowele and Ebiasah (2009), PU constitutes a significant clinical, quality of life, economic, regulatory and legal problem for providers, patients, as well as families. Its occurrence in patients is often considered to indicate the quality of nursing care provided (Aydin & Karadag 2010), therefore its prevention is a priority in nursing practice. However, it has been observed that despite the strong correlation of PU and quality nursing care, the strategies for pressure ulcer prevention are frequently accorded insufficient emphasis in practice. It is important to note that nursing care is central to successful prevention of PU thereby placing nurses at the forefront of prevention throughout the continuum of care. The duty to maintain tissue integrity, which is within the ethical responsibility of Nonmaleficence (do no harm) to patient, either intentionally or unintentionally can be achieved within the framework of understanding physiological, and biochemical processes involved in impaired skin integrity.

The UK quality improvement guideline for PU prevention (National Institute for Health and Clinical Excellence (NICE), 2005, cited in Stevens & Gray (2005), noted that education and training of healthcare providers is a significant strategy in prevention. According to the guideline, all staff caring for patients at risk must be educated and trained on risk assessment which must be conducted on admission to accident and emergency, which should also be repeated on admission to the wards. This knowledge requires updating in order to provide evidence-based information to enhance continuous quality improvement in care. It follows therefore that knowledge is a 'sine qua non' in PU prevention. Accordingly, Hulsenboom, Bours and Halfens (2007) noted that knowledge is a prerequisite for PU prevention and should be combined with insight and skills for the implementation of guidelines. Literature is consistent on the low to moderate level of knowledge among staff nurses on PU prevention (Pierper & Mott, 1995; Panagiotopoulou & Kerr, 2002). This is sometimes attributed to inadequate time and content allotted to PU prevention in undergraduate and diploma nursing schools' curricula (Sinclair, Berwiczonek, & Thurston et. al, 2004).

These observations are relevant to our local environment because in the researcher's clinical experience, many practising nurses are observed to consistently implement interventions which may be considered obsolete with no empirical evidence; an example is massaging and

applying talcum powder on bony prominences of at-risk patients. To corroborate the researcher's observation, Adejumo (2010), in a descriptive study of nurses' perception of activities to prevent PU in the University College Hospital, Ibadan, revealed a lack of consistency and non-availability of written standard for practice. Over thirty-two percent (32.6%) of nurses in the study preferred massaging bony prominences for periods between 10 and 30 minutes, demonstrating a serious gap in the practitioners' knowledge. This practice is clearly discouraged in many literature and guidelines (National Pressure Ulcer Advisory Panel (NPUAP) 2009; Wounds, Ostomy & Continence Nursing (WOCN), 2010). The same study also noted that although nurses reposition patients who are at risk for PU development, there was a lack of consistency in the turning schedules. Findings also showed that there were no written guidelines on this important aspect of care in that hospital.

Further impetus for this study was provided when the researcher, before the outset of this study, conducted a need assessment tour of five (5) Teaching Hospitals in South-West Nigeria. On those visits, it was observed that in the nursing admission assessment tool, there were no risk assessment nor validated scales for prediction of PU risk of patients during admission. This indicated that assessment of risk for PU were not given attention at the time of admission in these facilities. Literature supports that risk related to PU development needed to be identified on admission (Australia Wound Management Association; 2001, McErlean, Prendergast, Sandison et al , 2002). Therefore, to maintain skin integrity, it is expected that policies and procedures should emphasize skin assessment on admission to facilitate early identification of skin break. These records are to be validated daily, properly documented and reported (Ayello & Sibbald, 2008). It should be noted that in the absence of an objective evaluation and predictive tools, nurses rely completely on their clinical judgment to predict risk for PU development in hospitalized patients. Clinical judgment though considered an important factor in clinical decision making, the complete reliance on clinical judgment in predicting PU development has been faulted. Pancorbor-Hidalgo, Garcia-Fernandez, Lopez-Madina and Alvarez-Nieto (2006) conducted a meta-analysis to provide evidence for the clinical effectiveness of nurses' clinical judgment to predict PU occurrence. The report indicated a low predictive validity of clinical judgment. Evidence points to the use of clinical judgment in conjunction with a valid PU risk assessment scale.

High prevalence of PU in any setting calls for a need for nursing services to closely examine current care practices in relation to PU prevention, and also conduct a continuous quality improvement programme on PU prevention through education, in order to improve clinical practice in this area (Orsted, Rosenthal & Woodbury, 2009). The authors emphasized that best practices can only become a possibility when gaps in knowledge are identified and filled through appropriate education. In the three teaching hospitals where this study took place, there are no databases to provide a comprehensive prevalence of PUs. However, there are reports from different studies which indicate occurrence of PU among patients in these settings. For example, a prospective study of patterns of presentation of PU among traumatic spinal cord injured patients in the University College Hospital, Ibadan, (Iyun, Malomo, Oluwatosin, Ademola & Shokumbi 2011) indicated that 87.5% (N=67) developed PU within the first week of admission. In Lagos, following a 2-year (2004–2006) prospective study (Idowu, Ynusa, Gbadegesin & Adebule 2011) of PU risk factors in spinal cord injured patients admitted to the spinal cord injury unit, authors reported a 57.1% PU incidence rate among patients. The average hospital stay for this group of patients was also reported to be 33.1 days.

To provide a baseline data for this present study, the researcher undertook a PU prevalence/incidence audit. The study took place in four (4) selected wards (neuroscience, orthopedics, and medical wards (cardiac and renal) in the University College Hospital for three months (September - November 2009). All patients admitted into these wards during the period under investigation were examined for risk for PU. The audit tools were Braden scale for predicting risk and direct examination of patients' skin. Results showed that out of two hundred and eighteen (218) patients that were admitted into the neuroscience, orthopedics, and medical wards (cardiac and renal) during the period under investigation, 11% developed PUs on different locations of the body. This result corroborates previous findings of PU occurrence in our local settings (Oluwatosin, Malomo, Oluwatosin & Shokunbi, 1998; Onche, Yiltok & Obiano, 2004; Echezona, 2008), thereby providing a strong impetus for the conduct of this present study. An equipment audit was also undertaken at the same time, which identified inadequate pressure redistribution equipment to effectively manage the risk profile in patients. A major fall out of this study is that it will prompt a commitment to developing an effective management framework by nurses, which is aimed at identifying patients at risk for PU, and also initiating appropriate

interventions to reduce the incidence among hospitalized patients. This can only be achieved through appropriate knowledge building to drive other interventions, hence the need for this study.

1.2. Statement of Problem

The global focus on patient safety issues in recent times has brought PU prevention to the fore. Preventing PU is a patient safety and quality of care concern in nursing; and not only is it important to protect patients from harm, but it is recognized that PU prevention will also reduce both direct and indirect costs of care. In our local environment, pockets of incidence and clinical reports describe PU occurrence among hospitalized patients in different hospitals indicating obvious economic stress on the health care system and patients in particular, considering the out-of-pocket payment system for health care and the poor socio-economic status of most Nigerians.

Documented estimates of PU incidence varies by clinical settings, ranging from 0.4% to 38% in acute care, 2.2 % to 23% in long-term care (LTC), 0 % to 17% in home care (Reddy, Gill & Rochon ,2006). This is a strong indication that the burden cuts across all continuum of care with substantial financial implications.

Having a PU, particularly a stage IV ulcer, impacts on an individual's life in both overt and covert ways. Each individual's unique experience determines the definition of the impact on quality of life, more so because the construct of quality of life is individualized and reflects the person's perspective of life satisfaction. Quality of life in an individual with a PU incorporates such variables as pain and suffering. Therefore, the cost of PU can be measured in terms of the resultant pain, decreased mobility and activity, loss of independence and, even possibly, social isolation. The financial costs of health care, the strain on personal resources, and overall impact on one's life and activities of daily living (ADLs) (Langemo, 2005) are also considered. Additional morbid complications which may occur in a patient with PU include but not limited to bacteremia, squamous cell carcinoma, formation of sinus tract, osteomylitis, amyloidosis and sepsis (Shoemake & Stoessel, 2010).

Pressure ulcer among hospitalized patients is an indicator of quality nursing care. Experts assert that quality nursing interventions are paramount in order to prevent and expeditiously treat pressure ulcers (Labiak, 2008). However, experience has shown that some preventive strategies such as , instituting a turning schedule, are often begun when patients have

already developed skin changes, at which stage very little or no impact can be made towards preventing obvious break in tissue integrity.

Effective prevention of PU can only occur on the platform of knowledge of evidence-based interventions which have been found to be inadequate among nurse practitioners (Pierper & Mott, 1995; Panagiotopoulou & Kerr, 2002; Stevens & Gray 2005), thereby contributing to the high prevalence rate across care settings. In assessing how much Dutch nurses know about 28 strategies in the Dutch guideline for PU prevention, Hulsenboom et al. (2007) reported that majority of the nurses judged various non-useful measures as sometimes useful. Local studies on knowledge of PU prevention among nurses are few; however, available ones indicate a deficit in knowledge among nurses (Nursing Research Unit University College Hospital, 2009; Adejumo, 2010). This suggests an urgent need for an educational intervention within hospitals to provide an update on current practice in this important aspect of care. Furthermore, the researcher's clinical experience in the University College Hospital, indicate that patients' level of risk for PU development are never measured on admission, which possibly maybe related to poor knowledge of current evidence-based practice in relation to PU prevention. Nurses in these hospitals rely totally on their clinical judgment for decision making despite its low predictive validity (Pancorbor-Hidalgo, Garcia-Fernandez, Lopez-Madina, Alvarez-Nieto, 2006). To buttress the need for education, Orsted, Rosenthal and Woodbury (2009) emphasized that best practice is possible when gaps in knowledge are identified and removed and education can be used as a tool to kick-start the process of change. This will in turn lead to improved practice and reduce PU prevalence.

Currently, there is an obvious dearth of education (awareness and understanding) of what is considered evidence-based standard for PU prevention among nurses. It is hoped that the outcome of this study will seal the deficit using an educational programme as a tool. This hopefully will facilitate implementation of evidence-based interventions for prevention of PU on hospitalized patients.

1.3. Broad Objectives

This research portfolio has the following four broad objectives:

1. Assess nurses' level of knowledge and practice patterns to prevent pressure ulcers.
2. Implement an educational programme to update nurses' knowledge on PU prevention.
3. Determine if the programme improved nurses' knowledge and practice of strategies to prevent PUs.
4. Assess the effect of practice on patient outcome.

.

1.4. Specific Objectives

1. Measure the baseline knowledge of PU preventive strategies among survey nurses .
2. Determine the relationship between knowledge of PU prevention with level of education among the survey group
3. Examine the common practices for management of risk to prevent PU development among nurses in the quasi-experimental study.
4. Examine the factors which hinder preventive interventions for PU in the three hospitals
5. Determine the association of selected demographic characteristics (working experience, professional cadre, level of education, and previous exposure to PU lecture) on knowledge score in experimental and control groups pre and post intervention.
6. Determine the effect of educational programme on posttest knowledge scores in experimental and control groups.
7. Determine the difference in the posttest scores immediately and three months after intervention in the experimental groups.
8. Examine the difference in nursing practice for PU prevention before and after intervention across experimental and control groups.
9. Assess a point-prevalence of PU among patients in selected wards pre and 3 months post intervention in the experimental and control hospitals.

1.5. Research Questions

1. What is the baseline knowledge of PU prevention strategies among survey nurses?
2. What is the relationship between knowledge of PU prevention with level of education among nurses in the survey group?
3. How comparable are the practices for management of risk for PU among nurses in the quasi-experimental study?
4. What are the factors which hinder preventive interventions for PU in selected hospitals?
5. What is the association of selected demographic characteristics (working experience, professional cadre, level of education, previous exposure to PU lecture) on knowledge score in the experimental and control groups pre and post intervention?
6. What is the effect of educational programme on posttest knowledge score in experimental and control groups?
7. What is the difference in posttest scores immediately and three (3) months after intervention in the experimental group?
8. What is the difference in nursing practice for PU prevention before and after intervention across experimental and control groups?
9. What is the point prevalence of PU among patients in selected wards pre and 3-months post intervention in the experimental and control groups?

1.6. Significance of the Study

Patients' skin integrity has been a concern for nurses globally, and the maintenance of such was identified by the American Nurses Association as an important quality indicator of nursing care. Also any health care problem that can be identified at an early stage tends to be amendable to prevention. Orsted et. al. (2009) opined that the knowledge of PU risk factors is fundamental to pressure ulcer prevention; and therefore, every caregiver including the patients (where possible) needs to be aware of the risk factors and actions required to prevent ulceration. This emphasizes the significance of proactive preventive strategies as the key to maintaining skin integrity. Hospitalized, critically ill and mobility compromised patients are at high risk for PUs; therefore, successful prevention requires that caregivers have adequate knowledge and skill to identify risk factors and institute effective care required. It is hoped that this study will facilitate the development of policy and procedure for skin care, based on best available evidence. Furthermore, it is hoped that the study will achieve the following:

1. Provide further evidence on the level of nurses' knowledge of PU prevention strategies and the interventions being implemented for this purpose.
2. Facilitate the development and implementation of structured guideline for PU prevention as obtained in other countries, thereby providing opportunity for nurses to implement an up-to-date , evidence-based care to enhance quality nursing care, thereby enhancing effective assessment, management and documentation of risk for pressure ulcers.
3. The researcher recognizes that institutional support is necessary for implementation of the guideline , therefore the findings of this study will be available to hospital policy makers or management of the institutions, to provide information upon which decisions can be made with regards to the right equipment and resources to support implementation of evidence based interventions for PU prevention.
4. Study outcome will show the need to develop nursing manpower and employ clinical nurse experts in tissue viability to facilitate continuing professional education on new approaches to care, both to nurses and to management in general.
5. The educational intervention will provide the basis for decision making for nurses and empowerment, to make relevant suggestions to hospital management regarding the

purchase of right equipments and resources for PU prevention, thus improving the supply and technology for PU interventions.

6. The study will determine nursing and institutional factors that hinder implementation of strategies to prevent PUs. The understanding of such factors will provide the roadmap to resolution of such problems. The study hopes to bring about significant changes in practice towards inclusion of risk assessment as part of a comprehensive nursing assessment protocol.
7. Finally findings will provide an impetus for further studies with regards to prevention, management and incidence of PUs.

1.7. Delimitations/Scope of the Study

The study is delimited to three teaching hospitals in South-West Nigeria, out of the seven teaching hospitals within the geopolitical zone. The hospitals are University College Hospital, (UCH) Ibadan, Lagos State University Teaching Hospital (LASUTH) and Obafemi Awolowo Teaching Hospital Complex (OAUTHC), Ile Ife.

1.8. Operational Definitions of Terms

Effect: The change in nurses' level of knowledge of PU prevention strategies and the adoption and utilization of guideline as observed by the researcher in the model wards using a checklist.

Educational Programme: A formal workshop on PU prevention provided by the researcher. Content is adapted from Evidence- Based Pressure Ulcer Prevention package (Clay 2008). It is aimed at updating the knowledge of nurses in the experimental groups (UCH and LASUTH). The contents include the structure and the functions of the skin, pathophysiology of PUs, risk factors, identification of risk and management of the identified risk in hospitalized patients and documentation.

Nurses: Nurses in this study are registered professionals who provide direct care to patients in the Medical (cardiac, neuroscience), Surgical (Orthopedics), and Accident and Emergency (A & E) of the selected settings. They are within the cadre of Staff Nurses (SN), Nursing Sisters (NO

and SNO) and Principal Nursing Officers (PNO), Chief Nursing Officers (CNO) and Assistant Directors of Nursing (ADN).

Risk: The probability of patients developing pressure ulcer during hospitalization as identified by nurses.

Pressure Ulcer: Stages of impairment in skin, subcutaneous and underlying tissue integrity following exposure to constant pressure, friction or shear forces among hospitalized patients, identified on any part of the body especially bony prominences.

Knowledge: For the purpose of this study, knowledge is measured by the differences in score obtained at pretest- posttest on PU Knowledge Test (PUKT) by Pieper and Motts (1995). Of a total of 47 items, representing 100%, knowledge is measured as follows: *less than 24 correct responses: Low knowledge (<50%), 33 to 47(>70%) High knowledge.*

Preventive Strategies: In this study, PU preventive strategies include nursing assessment to identify patients at risk for PUs and the interventions to manage the identified risks in order to prevent PU development. This is provided in the educational package.

Selected Hospitals: The selected hospitals for this study are the University College Hospital (UCH), Ibadan; Lagos State University Teaching Hospital (LASUTH), Lagos, and Obafemi Awolowo Teaching Hospital Complex (OAUTHC), Ile-Ife, Osun State.

Practice: Practice in this study refers to the researcher's observation of how nurses in the intervention group utilize the developed guidelines on patients in the selected wards in the experimental hospitals.

CHAPTER TWO

LITERATURE REVIEW

2.0. This chapter examines literature related to the incidence, prevalence of, pathogenesis, the theoretical and empirical studies on PU, as well as the conceptual framework and hypotheses.

Pressure ulcer bas been observed in the Egyptian mummies as far back as the sixteenth century as described in early text such as Fabricus, Torrance, and Parse (1983), cited by Adejumo (2010). The condition has become a topical issue today because of the increased incidence and prevalence among the elderly population , mobility compromised hospitalized and critically ill patients (Cox 2011). Preventing PU is a priority goal in planning nursing care for individuals with identified risks.

The effective implementation of PU prevention by clinician requires that the individual practitioner should possess an understanding of epidemiology of PU, etiology of PU development, key predisposing factors and also recognize the strategies necessary to manage the risk factors. The National Pressure Ulcer Advisory Panel, (NPUAP) (2009) explained that specific education on PU prevention for all nursing personnel is required to achieve this goal.

A PU is an area of skin and surrounding tissue damage resulting from a pressure assault. It maybe superficial, which is not more than an abrasion , or may become deep and infected constituting a source of great discomfort to the patient and requiring extensive care and treatment. In addition to this, its prevalence and treatment constitutes a significant healthcare burden in term of cost and nursing hours. According to Clark, Whytock, Handfield, Van der wal and Gundry (2005), such treatment increased nursing time by 50%, while the estimated cost per ulcer was found to be US $ 10, 000 to $86,000 with a median cost of $27000. The maintenance of skin integrity in hospitalized patients is globally seen as the responsibility of nurses, thus the occurrence of PU has been identified as a nurse-sensitive quality indicator in the healthcare settings. A nurse-sensitive quality indicator implies those conditions which are amenable to quality nursing care. In other words, where systematic evaluation of patients for the identification of risk for PU is in place with adoption of appropriate preventive protocols, evidence suggests that the rate of occurrence is reduced greatly.

2.1. Brief Anatomy and Physiology of Skin

The skin is the widest organ in the body, composed of three layers : epidermis, dermis and hypodermis (subcutaneous tissue). The epidermis makes up the outmost layer. It is avascular, consisting of an outer dead cornified portion that serves as a protective barrier and a deeper, living portion that fold into the dermis. The epidermal cells (melanocytes 5% and keratinocytes 95%) are constantly replaced every thirty days. The melanocytes are responsible for secreting melanin which gives colour to the skin and hair and provides protection from ultraviolet rays. Keratinocytes on the other hand are synthesized from epidermal cells in the basal layer, producing a specialized protein (keratin) which is vital to the protective barrier function of the skin. The upward movement of keratinocytes from the basement membrane to the stratum corneum takes approximately four weeks. (Lewis, Heitkemper & Dirksen, 2000).

The dermis is the supportive connective tissue, highly vascular and assisting in temperature and blood pressure regulation. The greatest part of the dermis is formed by collagen, and it is responsible for the mechanical strength of the skin. Also found in the dermis are elastin fibres, nerves, lymphatic vessels, hair follicles, sebaceous and sweat glands.

The hypodermis (subcutaneous tissue), though not traditionally a part of the skin, is sometimes discussed with the skin because it attaches the skin to underlying organs and tissues. The loose connective tissue and the fat cells provide insulation to the body.

Like every other organ, the skin sometimes fails functionally and structurally in spite of excellent care (Krapfl in Stokowski, 2008), because the skin and, the underlying tissues depend upon the proper functioning of other organs and systems of the body. It suggests therefore that in the patients with major organ failure; the skin can be compromised, resulting in alteration in structural integrity.

The skin naturally functions by protecting the body from injury, regulating body temperature, noting sensation and metabolism. However, in the older adult with aging process, the skin also ages with resultant loss in thickness and elasticity thereby appearing drier with decreased circulation. These changes expose the skin to impairment and break.

2.2. Normal Physiological Response of Tissues to Pressure: Studies have established that the normal pressure in the capillary bed is between 12 and 32mmHg. In 1930, Landis suggested that the mean arterial pressure is 32mmHg and when this pressure is exceeded, capillary occlusion ensues. Later in 1941, Landis revised his work and concluded that the capillary closure pressure should be between 45 and 50mmHg, over which threshold damage was likely to occur. It is important to note that the effect of pressure differs, depending on the body part, local bone, muscle and skin structure.

The capillary loops in the skin run vertically to the surface and are coiled at the bases, thereby limiting the risk of occlusion because of direct pressure. However, in subcutaneous tissue, the blood vessels lie mainly in the parallel planes of the deep fascia and follow the paths of ligaments and nerves. This arrangement renders them very vulnerable to distortion and occlusion because of pressure from external sources and the underlying structures(Bliss 1993).

2.3. Pathogenesis of Pressure Ulcer

The pathogenesis of PU involves some mechanisms involving such factors as impaired mobility, fecal and urinary incontinence and decreased healing capacity of the tissues. These factors are responsible for increased shear stress, friction and pressure which are the fundamental factors in PU development. Prolonged pressure induces ischemic changes, and recent studies (Anon, 2009) have shown that cyclic ischemia- reperfusion injuries play an important role in the formation of PUs. The ischemia -reperfusion model of tissue damage describes that damage initially occurs with hypoxia which is then exacerbated with the restoration of oxygen (reperfusion). It should be noted that the initial lack of oxygen causes production of toxic metabolites which depletes the cellular antioxidant defenses. The return of oxygen is accompanied by biochemical reactions that are normally controlled by antioxidants. Without the protection of antioxidants, additional tissue damage occurs. On the ischemia–reperfusion model, Bliss (1993) holds that the sudden increase in blood flow (reperfusion) maybe as much as 30 times the resting value culminating in the bright red flush often noted and referred to as reactive or blanching hyperemia (normal response). In as little as five seconds of exposure to external pressure, a physiological reaction can be provoked that may be one third or three quarters of the period of ischemia. If the lymphatic vessels of the dependent tissue remain intact and excess interstitial fluid is removed, it is believed that permanent tissue changes will not progress.

However, when local defenses against free radicals are lost, oxidative damage can occur directly under ischemic skin due to free radical interaction with protein and lipid membranes. Furthermore, Bliss (1993) explained that cellular damage can spread in a chain reaction fashion to tissues around and below the initial site of damage, resulting in the typical tissue loss commonly seen in PUs. In addition to the direct damage, excess free radicals also act as a trigger for cell signal for inflammatory cells which further add to tissue loss. The combination of these events initiates rapid pressure ulcer development.

Blanching hyperemia is described as the distinct erythema caused by reactive hyperemia which when light pressure is applied will blanch, indicating that the patient microcirculation is intact. Non-blanching hyperemia (an abnormal physiological response) is detected when the colour of the erythema remains upon light finger pressure, indicating disruption in the microcirculation. Clinical examination for erythema involves applying light pressure to the area for 10 seconds and upon releasing the pressure, if the area is white and then returns to original colour, then the area possibly has adequate blood supply. However, observation should continue and preventive strategies should be implemented. But if the area remains the same without change in color as before pressure was applied, it is an indication of beginning tissue damage, therefore preventive strategies should be implemented without further delay. Furthermore, if there is alteration in skin colour (redness, purple, black), increased heat or swelling, this may indicate underlying tissue breakdown. In such situation, more frequent nursing assessment should take place. Areas of localized heat, damage or coolness, purple or black discoloration, localized edema and indurations indicate pressure ulcer development in a dark pigmented individual.

Often other clinical signs such as blistering, indurations, and edema are associated. It should be noted that the vessels in the subcutaneous tissue also give rise to the perforators that supply the skin, and so the deep vessel obstruction is likely to result in both cutaneous and subcutaneous ischemia if the period of occlusion is sustained. If tissue collagen level is not depleted, this helps to prevent disruption to the microcirculation by buffering the interstitial fluid from external pressures, thereby maintaining optimum hydrostatic pressure.

The view that ulcer forms simply ‘ from without inwards’ when there is unrelieved pressure on the skin has been replaced with the theory of deep tissue injury, which postulates that externally applied pressure increases pressure and damage in the deep tissues near bony

prominences before causing visible damage at the skin surface(Berlowitz & Brienza, 2007). This is so because the soft tissues are compressed/or sheared between the skeleton and a support such as bed or chair in a sitting or lying position. The authors explained further that ischemia caused by capillary occlusion, reperfusion injury, impaired lymphatic drainage of metabolic waste and prolonged mechanical deformation of tissue cells are the processes presumed to damage the soft tissues.

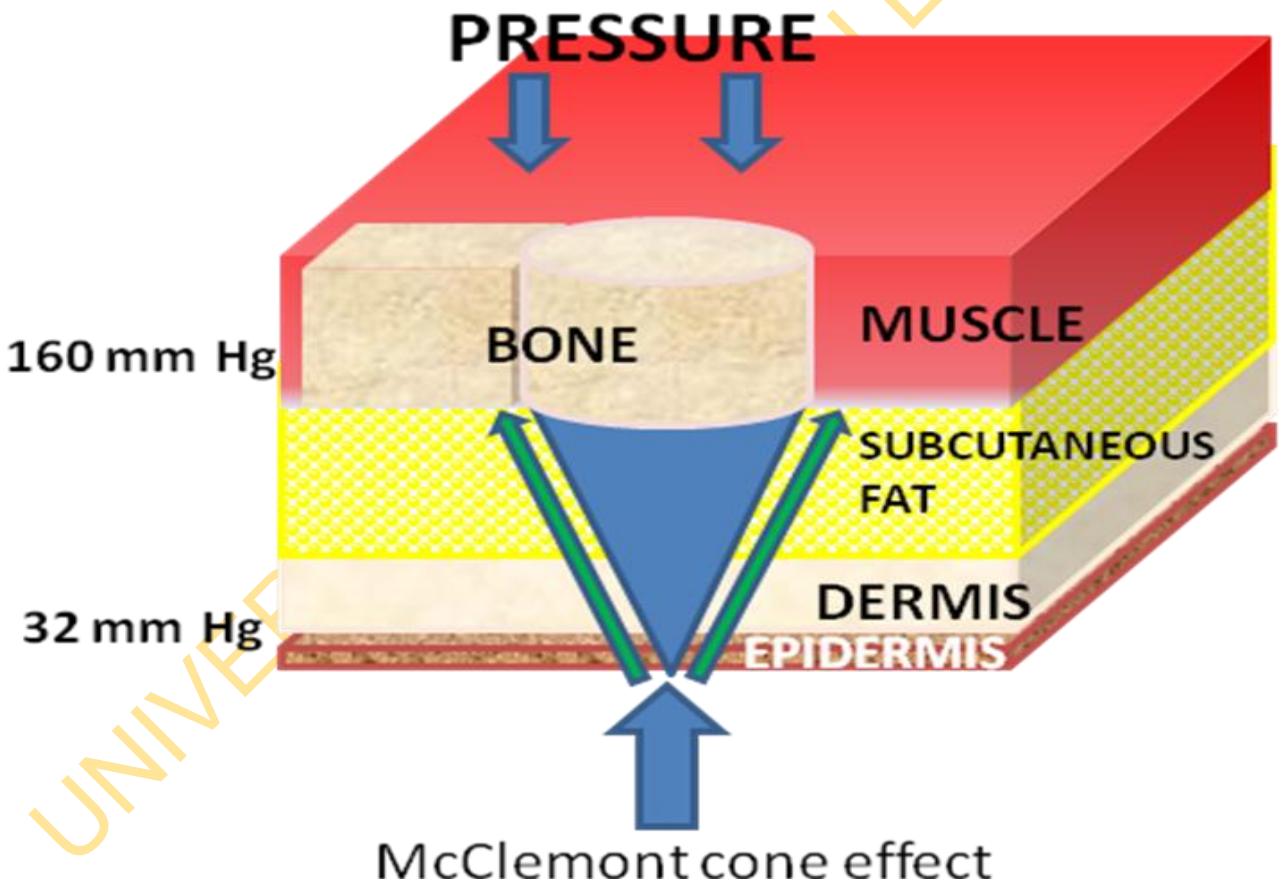
2.4. Models of Pressure Ulcer Development

The human body is basically a composite of cells which are specialized and organized to form tissues and organs. There are four basic tissues in the human anatomy: epithelial, connective, muscle and nervous tissues. The cells of the epithelial tissues are tightly packed to form continuous sheets that serve as linings in different parts of the body including the outer layer of the skin. The connective tissues are of different types, providing support and structure to the body. Some connective tissues include the inner layers of the skin, tendons, ligaments, bone, cartilage and fat tissue. The muscle tissue is a specialized tissue that can contract and they contain specialized protein: actin and myosin which slide against one another to allow movement. Finally, the nerve tissue which is composed of the neurons and the glial cells generate and conduct electrical impulse throughout the body. All these tissues are involved in the models of pressure ulcer development.

Two models; the top-to-bottom physiological model and the bottom-to-top models provide opposing physiological descriptions of the process of PU development. While the top-to-bottom model assumes that damage begins at the surface of the skin, working down to the soft tissues and bones in stages according to the visible depth of tissue damage, the bottom–to-top model (Sharp & McLaws, 2005), suggests that damage begins at the bone and works up through the muscles towards the skin, with visual assessment of the skin giving no indication of the extent of damage to the underlying tissues. This is termed McClemont cone of pressure. McClemont cone pressure explains that in sitting or lying position, pressure is transferred from external surface through skin layers towards the underlying bone, compressing the subcutaneous tissue, blood vessels and muscles. These tissues act as counter pressure. The result of these series of events is a cone or pyramid shaped pressure gradient, with the apex of the cone equating the bone surface where tissue interface pressures are highest. The resultant effect is increased

pressure intensity on the deep tissues (muscles/bony surface) than on the epidermis. Consequently, necrosis occurs first in the deep tissues at the bony interface, because muscle tissue are more sensitive and resistant to pressure than the skin. Pressure exerted at the bony interface then emerges at a point in the surface of the skin. A small, inflamed area, over a bony prominence, may indicate tissue breakdown that is much deeper and wider than indicated on the surface of the skin. This model of PU development explains how the extensive tissue damage described in Stage IV PU may be concealed by intact skin, which would traditionally be categorized as a Stage I ulcer.

Figure 2.1



However, relieving pressure on any part of the body may cause reactive hyperemia; a protective response normally observed after arterial occlusion. This may be noted during repositioning and appears as erythema: redness or flushing of the skin that was under pressure caused by the reflux of arterial blood. Once the erythema has disappeared, it maybe wrongly assumed that the potential for serious damage to the blood vessels in both immobile and healthy mobile subjects no longer exists. When erythema is persistent, even when light pressure is applied to the skin, it is known as a non-blanchable erythema and may be accompanied by changes in skin temperature and consistency, with or without itching. In such cases, practitioners who use staging or grading systems to indicate the depth of tissue damage (Australian Wound Management Association, 2001; EPUAP, 2002) would usually identify this as Stage I (or Grade 1) PU. Unlike the discolouration produced by reactive hyperemia, non-blanchable erythema is significantly associated with the development of pressure ulcers; so it is important to clarify the difference between these two terms, which are often used interchangeably. Also important is the fact that reactive hyperemia is a normal response following arterial occlusion, while a non-blanchable erythema is an abnormal response presenting as a 'persistent redness' which characterizes a Stage I PU.

In clinical practice, it may be difficult to distinguish between the discolouration of non-blanchable erythema and that caused by reactive hyperemia, which can make a reliable assessment of the skin difficult (Halfens, Bours Van Ast, 2001). The ambiguity associated with these terms result in two common misconceptions. First, reactive hyperemia and non-blanchable erythema are often mistaken. Secondly, non-blanchable erythema is often seen as an indication of risk rather than the presence of pressure damage (Joana Briggs Institute, 1997; Papanikolaou, Lyne, Lycett, 2003).

A survey of nurses in Sydney, Australia, (Sharp et al, 2000 in Sharp & McLaw 2005) found that more than a quarter of the study participants considered that, because the skin remained intact, classification of skin damage as Stage I was a risk factor for the development of PUs. Changes in the skin should not be relied upon to indicate the beginning process of PU as irreversible damage to the deep tissue is already in place. Accordingly, the NPUAP (2008) classified this stage as Deep Tissue Injury (DTI), which is described as purple or maroon localized area of discoloured intact skin or blood-filled blister due to damage of the underlying soft tissue from pressure or shear. The area may be preceded by tissue that is painful, firm,

mushy, boggy, warmer or cooler as compared to adjacent tissue. The panel observed that deep tissue injury maybe difficult to recognize in dark skin tones. Evolution of DTI may include a thin blister over a dark wound bed which further evolves and becomes covered by thin eschar. It may heal or rapid progression may take place with exposure of additional layers of tissue, even with optimum treatment. In both models of pressure ulcer development described above, PU results from a complex relationship between these three risk factors and other causal factors. When pressure is transmitted from any type of surface, such as a mattress or chair, damage is traditionally thought to start at the skin, progressing down to the blood vessels, then to the subcutaneous fat, muscle and eventually the bone. This is known as the top-to-bottom model of PU development. The Australian staging system is based on this model.

2.5. Etiology of Pressure Ulcer

The term PU and decubitus ulcers are often used interchangeably. The word 'decubitus' meaning 'lying-down' is from the Latin word 'decumbere'. Some authors argue that the term 'decubitus ulcer' does not adequately describe the condition because it excludes ulcerations which occur in other positions such as prolonged sitting over the ischial tuberosity. In view of the fact that the pathogenesis of PU identifies prolonged pressure as the denominator, some authors advocate the retention of the term 'Pressure sore or ulcer (Revis, 2008). However, opinions differ as Parish and Witkowski (2004) cited in Stokowski (2008) proposed a return to the original term 'decubitus ulcers' because of the implication of other factors in its pathogenesis .

Many mechanisms and factors contribute to the development of PU but the final common pathway is pressure which results in ischemia. Others include friction, shear forces, moisture, temperature elevation, and sensory impairment. Tissues are capable of withstanding pressures of short duration; however, prolonged exposure to pressures slightly above the capillary filing pressures (32mmHg) initiates a downward spiral towards ulceration. Revis (2008) noted that muscle tissue is the least resistant to pressure and thus necrosis occurs before apparent skin breakdown is noticed in clinical practice. This is particularly difficult for the inexperienced practitioner to observe. However an informed practitioner can assess and identify the risk status to PU.

The term 'risk' refers to the probability of an individual to develop a specific problem, which in this case a PU. The central factor in PU development is the inability of the individual

to withstand the adverse effect of pressure, friction and shear, which is described as the 'tissue tolerance'. Tissue tolerance is affected by intrinsic and extrinsic factors. Intrinsic factors or factors within the individual include mobility status, age of individuals, nutritional status, skin condition, chronic illness, use of steroids and level of consciousness. Extrinsic factors on the other hand refers to mechanical influences including pressure, friction, humidity and shear forces which are traditionally regarded as the major risk factors associated with the development of PU. These risk factors are discussed below:

Pressure: This is a perpendicular load or force exerted on a unit of an area such as sacrum (Collier & Moore, 2006). The stirring event is the compression of tissues by body weight against external surfaces, such as mattress, wheel chair pad or bed rail. Shear forces and friction are other traumatic forces which could be present, causing microcirculatory occlusion as pressure rises above the capillary filling pressure with resultant ischemia and consequent tissue anoxia. Tissue anoxia leads to cell death, necrosis and ulceration. Literature suggests that irreversible damage can occur after two hours of uninterrupted pressure (Revis, 2008). Sharp (2005) compared the effect of interphase pressure between anaesthetized patients on operating table and those on the emergency room trolleys. The report suggests that patients with conditions of immobility such as in spinal cord injury and anaesthetized surgical patients are at risk because they are unable to sense the discomfort of pressure to initiate movement. This is because the patients are subjected to interface pressures much higher than the 28-38mmHg, which some authorities still consider a safe level of pressure in healthy subjects. High pressures have been recorded between such patients' skin and support surfaces, with 56-60mmHg over the sacrum of a patient on an emergency department trolley and 75-80mmHg over the sacrum of an anaesthetized patient on an operating theatre table. In a study of analysis of risk factors among elderly hospitalized patients, Magahaes, Gragnani, Veiga, Blanes, Galhardo, Kallas, Juliano and Ferreira (2007) noted the crucial implication of pressure in altered skin integrity, which suggest that pressure of 70mmHg over a bony prominence for periods not less than two hours is enough to cause an ischemic wound. This implies that the limit at which interphase pressure is injurious to tissue is influenced by the state of the tissues and patients' co-morbidities.

Transmission of pressure: Any external pressure measured at an interface will be transmitted from the body surface (skin) to the underlying bony structures, compressing all the intermediate tissues. The resultant pressure gradient has been described as McClemont 'cone of

pressure', in which external pressure can increase by three to five times at the point of greatest pressure experienced, such as at the bony surface. For example, an external interface pressure of 50mmHg could rise to as much as 200mmHg at a bony prominence such as at the ischial tuberosity. Stenmez and Langemo, cited in Sharp (2005), explained that occipital tissue interface pressures higher than 32mmHg have been recorded in patients undergoing coronary artery by-pass graft surgery, which resulted in tissue ischemia in areas of skin over bone because the skin over bone has a significant ($p<0.001$) stiffer load deformation relationship than skin over muscles. The authors however observed that subcutaneous pressure required to reduce the all-important transcutaneous partial pressure of oxygen ($TcPO_2$) was not significantly different ($p>0.05$) for skin over muscle (36+/-11mmHg; mean+/-standard deviation) than for skin over bone (28+/-10mmHg). If pressure is distributed as earlier described, any external skin 'blemish', however minor, may be considered as indicating that necrosis of the underlying tissues is already established. This supports the view that patients who are at risk of developing PU need to be protected from insisting pressure to all parts of their bodies, including soft tissue as well as bony prominences because the skeleton lies deep to soft tissue in any body part under pressure.

The level of pressure required to cause tissue damage varies from person to person and according to such factors as location and the disease process (National Institute of Clinical Excellence (NICE), 2005). For example, what is considered a tolerable level of pressure in some patients, may be too high for those with peripheral vascular disease (PVD) who may develop an ulcer within a very short period of time if they are immobile (Stenmez and Langemo in Sharp, 2005). On the other hand, mobile patients with PVD may initiate many more lower-limb movements (73 (SD50) mmHg an hour) than healthy subjects (11(SD12)mmHg an hour), possibly due to the body's physiological attempt to increase blood flow to the lower limbs. If movement was not possible in these patients, the result might be the rapid development of a PU.

The time/pressure relationship was initially reported in dogs, with ischemic ulcers developing after pressures of 60mmHg were applied for one hour (Kosiak, 1959). Subsequent studies of the time/pressure relationship in healthy volunteers concluded that the variations in hyperemic responses were due to intrinsic physiological differences. This explains why a group of 16 patients over 60 years with atherosclerotic disease responded differently to pressure applied for one hour. In that study, while four subjects showed no change in their blood flow, four others

had increased skin blood flow to ≥150% of baseline flow and eight had decreased skin blood flow to ≥50% of baseline flow, with three of these having a final blood flow of zero (Frantz, Xakellis, Arteaga, 1993). It is, therefore, conceivable that patients with morbid conditions may respond with different degrees of injury, with regard to the time/pressure relationship in PU development.

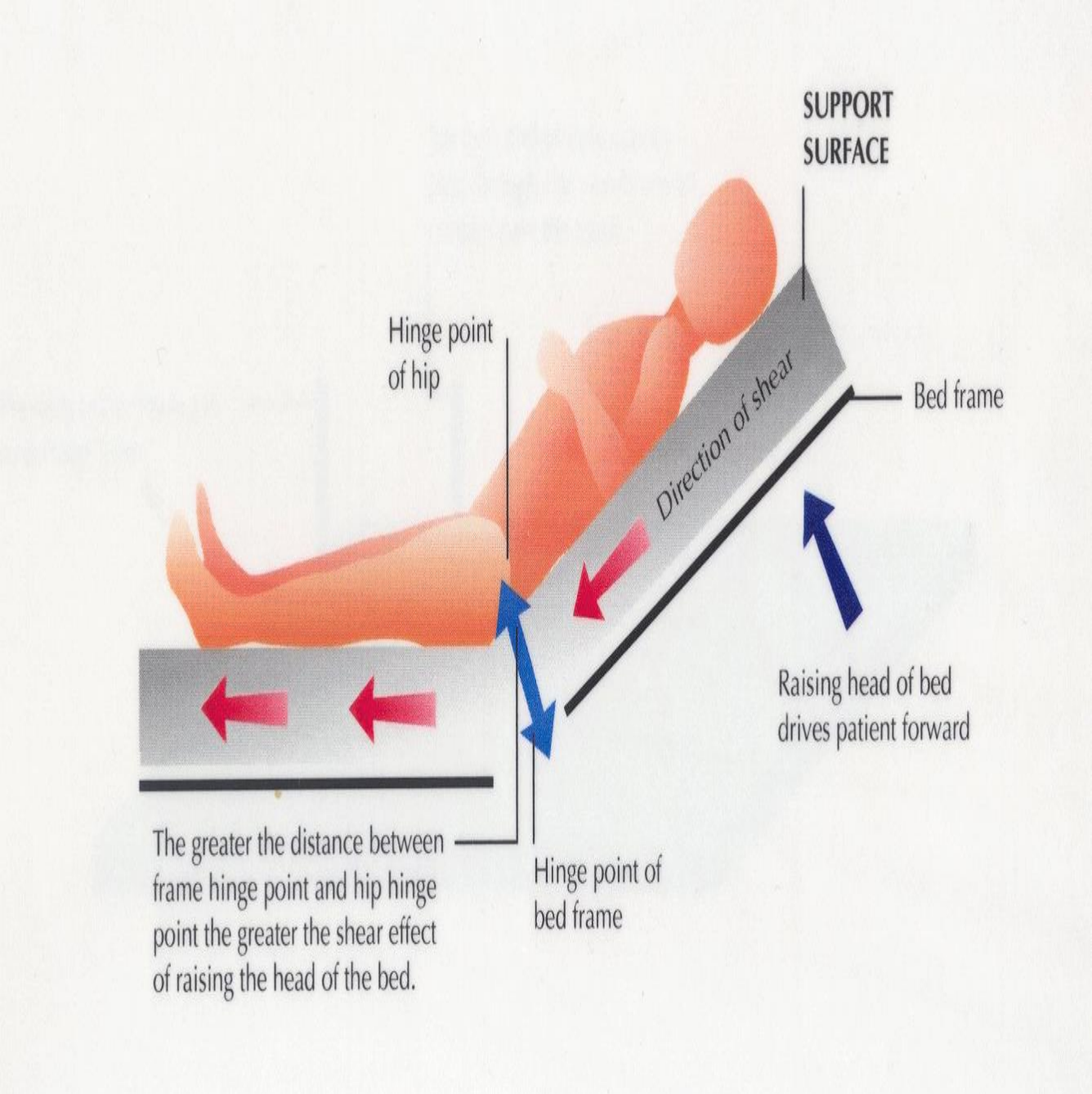
Age and PU: Young children are also at risk for PU development. In a study of children in an acute hospital setting, Willock, Huges and Tickle (1999) noted that the occiput and ears are particularly at risk for pressure ulcer development due to the disproportionate size at infancy. Authors observed that because children below two years have less hair and poor subcutaneous tissue on the head compared to older children and adult, and were also often placed in supine position, the predisposition to PU on the head is increased. Other factors observed to increase the predisposition of the young children to PU development include incorrect use or application of medical devices like chest braces, splints, catheter etc. Any impairment in the integrity of the skin increases the risk for infection, thereby reducing the capacity of skin to resist the effect of pressure, shear and friction.

Shear: Shear is a mechanical stress that is parallel to a plane of interest. For example, when the head of the bed is raised or a patient slides downward in a chair, the body is angulated above the support surface, causing the skeletal muscles and deep fascia to slide downward with gravity while the skin and superficial tissues adhere to the chair surface or bed linens. This shear force can cause a change in the angle of the vessels, and thus, compromise blood supply, resulting in ischemia, cellular death, and tissue necrosis (Niezgoda & Mendez-Eastman, 2006). When a high level of shear is present, then the amount of external pressure necessary to produce vascular occlusion is only about half the amount when shear is not present.

In addition to this, many authors have noted that when the head of the bed is elevated there is automatically a greater compressive force placed on the sacral tissues than when the bed is in the flat position. It is believed that shear –related ulcer may develop as a result of patient's sacral skin adhering to the bed linen (in the sitting position), where the deep fascia moves in a downward direction with the skeletal structure as a result of gravitational forces. At the same time the sacral superficial fascia remains attached to the sacral dermis. This effect can be minimized if the patients' support surfaces are covered with a vapor-permeable two-way stretch cover that helps reduce moisture build-up at the interface. However, if the effects of shear are

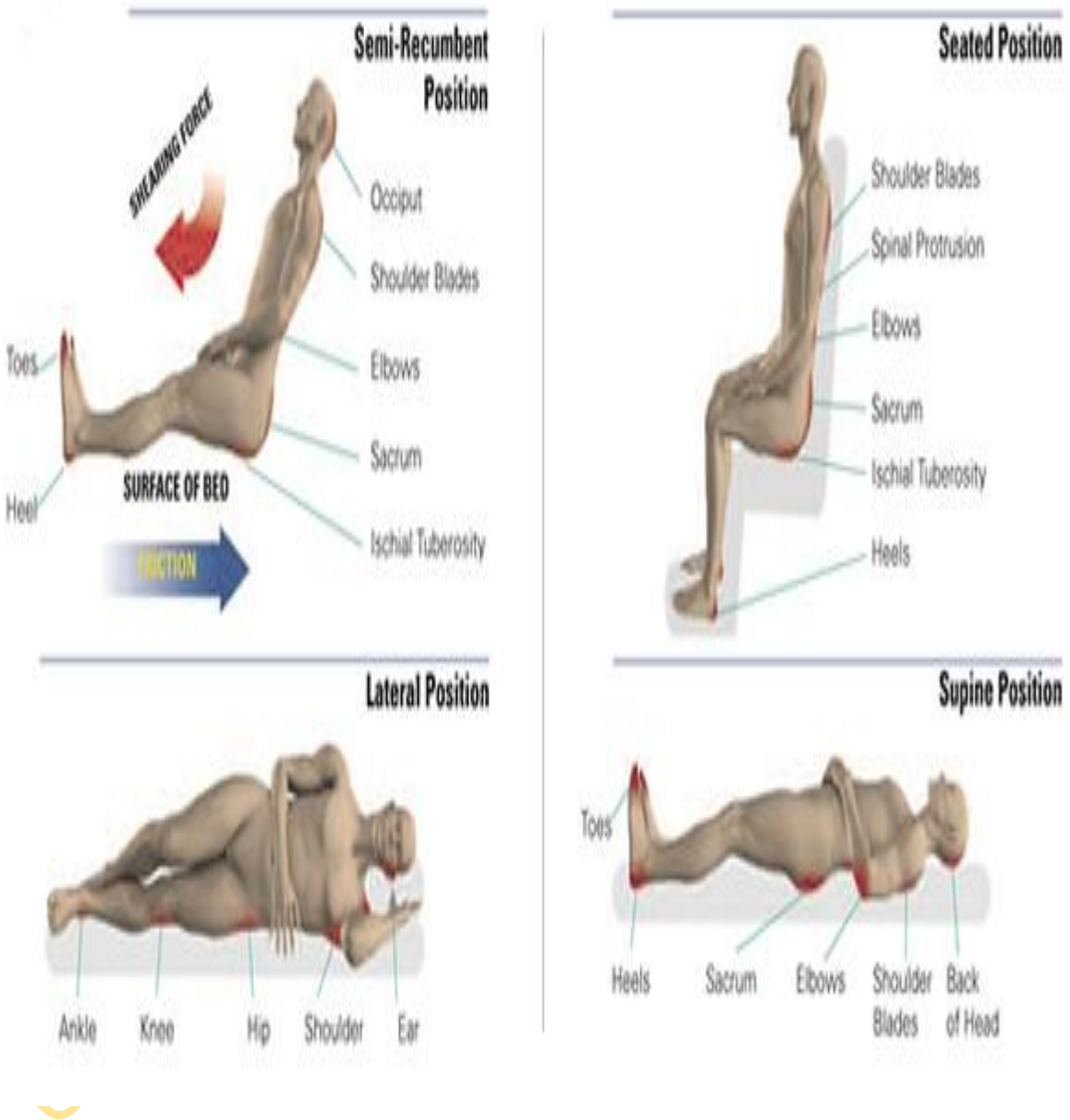
prolonged or exacerbated by the presence of moisture, regional stretching of the microcirculation of the skin occurs; and if this is left unchecked, it results in rupture of local capillaries, arteries and arterioles, thereby increasing the possibility of development of some localized tissue necrosis. Shearing is potentially the most serious of the three main risk factors (pressure, friction and shear) because of the speed with which tissue damage occurs (Scemons & Elston 2009) . For example, shear forces occurs moving an anaesthetized patient across an operating table, thereby causing tissue over bony prominences to be dragged against a surface and increasing the risk for break in tissue integrity. In older patients, the effects of shearing may be exacerbated by loose, fragile tissue, where the elasticity of the thinning epidermis has diminished and dermal blood vessels have been lost, with the result that tissue is sheared or dragged away from its attachment to the bone and local blood vessels are ruptured (Osted, Ohura, & Harding 2010; National Pressure Ulcer Advisory Panel 2012) .

Figure 2.2.



Shear effect of raising head of bed (Source: Johnston & Hodgson, 2009 .nhsggc.org.uk)

Figure 2.3.



Areas at risk based on position (Source:www.invacare-cc.com)

Friction: Friction occurs when two surfaces move across each other as occurs when sliding a patient from bed to wheelchair. Friction itself is not believed to be a primary factor in the development of PU. However, it can exacerbate the stripping of broken epidermis or be the cause of an initial break in the skin, which may then be compounded by the effects of pressure and shear forces. Moreover, moist support surfaces have been shown to increase the friction coefficient and if this is great enough will cause adherence of the patient's skin to the damp surface, thereby further increasing the associated shearing effects. In other words, friction on wet skin can result in persistent redness, which is often incorrectly classified as a Stage I PU, regardless of mobility.

2.6. Epidemiology of pressure ulcer : Prevalence and Incidence.

The frequency of pressure ulcers are described in terms of prevalence and incidence studies. These studies provide a picture of PU burden in a facility.

Prevalence is a measure of the number of cases of pressure ulcers at a specific time, thereby providing a description of the total burden of the disease (Berlowitz, 2014). This insight facilitates planning for health care resources. In other words, the prevalence rate of PU describes the proportion of the population that have developed PU at admission and during the period of admission including new and ongoing cases. Two measurements are used to describe the prevalence of PU; Point and period prevalence. Point prevalence provide a measure of PU occurrence at a specific date(one day) or event while period prevalence describes the occurrence of PU over a period of time such as throughout hospitalization. Prevalence rates is a useful measure of PU burden but does not provide a picture of the quality of care (Agency for Health Research and Quality (AHRQ) 2011). Incidence studies on the other hand provide a description of only the number of new cases and focuses on people without an ulcer at baseline. It accounts for only cases which develop after admission into a facility. It is considered a more direct measure of the quality of care as well as the causative factors. This suggest that quality improvement projects should focus on incidence studies of PU to evaluate effectiveness of preventive programs. (AHRQ 2011, Berlowitz, 2014)

Carol, Davis and Nigel (2008) noted that a wide variation exists in the incidence and prevalence rate of PUs reported in the medical and nursing literature. The reasons are attributed to

differences in population of patients studied, differences in data collection and methodology, as well as differences in the quality of care provided.

Epidemiological studies conducted in multiple countries demonstrated a clinically relevant prevalence in multiple settings (Lindgren, Unosson, Fredrikson, Ek A-C 2004). In the United States of America, the prevalence varies from 10% to 17% in the acute care settings, 0% to 29% in home care , and from .3 to 28% in the long-term care settings (Aydin & Karadag 2010). Janis and Kenkel (2003) observed that the highest incidence is seen in elderly patients with femoral neck fractures (66%) and in quadriplegic patients (60%). Pressure ulcers are significantly more common among patients with spinal cord injuries than in the non-injured population. As the elderly people become the fastest growing segment of the American population, nursing-home residents are recognized to be at high risk of developing pressure sores.

In 1990 Brandeis, Morris, Nash, and Lipsitz conducted a large study of elderly persons admitted to nursing homes without a prior history of a PU. According to the study, 13.2% developed an ulcer during their first year at the facility and 21.6% developed an ulcer during the second year. By comparison, among patients who were already in nursing homes and were without PU, 9.5% developed PUs during their first year and 20.4% in their second year. These suggest that PUs predominate the long-term care settings as residents have co-morbidities and high risk factors for its development such as decreased mobility, advanced age, decreased activity, malnutrition and chronic medical conditions(Margolis, Knauss, Bilker& Baumgarten, 2003; Mathus-Vliegen 2004).

Prevalence studies of PUs also take cognizance of common body sites of PU development. This brings to the fore the reason for the argument related to the terms ‘decubitus ulcer’ and ‘pressure ulcer’. Authors argue that since all sores do not occur while in supine position, the term ‘ decubitus’ is therefore not very appropriate rather ‘pressure sore’ provides a better description of the ulcer, because pressure is the major predisposing factor (Bauer, Mancoll, Phillips; 2007). For example, ischial sores occur on chair –bound patients in a sitting position, while in prone position PU can occur on the chest wall, knees and toes. In terms of pressure sore location, Bauer et.al (2007) maintained that 96% occur below the level of the umbilicus, commonly in either the supine or seated position. Furthermore, up to 75% of all PU

is located around the pelvic girdle. This is not unexpected, as it epitomizes the distribution of pressure in supine and sitting positions.

In Nigeria an extensive review of literature indicated a dearth of studies on country-wide prevalence of PU. However, facility-specific studies confirm occurrences of PU among patients under care. For example the result of a study in Osun State, (Onigbinde et. al 2011) reported that PUs are very rampant in the local hospital particularly among the mobility-compromised patients, affecting approximately 9% of hospitalized patients within the first two weeks of admission. Furthermore, in a spinal cord injury unit in Lagos, Idowu et. al (2011) reported a 57.1% incidence rate within a two year period (October 2004 to November 2006) among spinal cord injured patients. The duration of hospital stay for this group of patients was reported to be 33.1 days. However, the duration for those without PU was not precisely stated. In Enugu, an unpublished data at the National Orthopedic Hospital (Echezona 2008) concluded that of 59 patients with spinal injuries who were admitted between Jan. 2005 and Dec. 2006, 19 (11.2%.) of the patients developed PU, out of which 16 were sacral and 8 were on the trochanteric ulcers. In yet another study among spinal cord injured patients in Gombe State, Onche, Yiltok & Obiano (2004) reported that 16 out of 28 patients (57%) developed PU at different sites. The authors attributed this high incidence to inadequate knowledge of preventive interventions among practitioners, as well as lack of required pressure redistributing equipments in the hospital.

Similarly clinical survey of PU based on body site in University College Hospital, Ibadan (Oluwatosin et. al, 1998) showed that out of 71 patients (100%) admitted , sacral PUs were found on 30 (42%) patients, 22 (31%) had ulcer on the trochanter, while 8 (11.3%) patients developed PU on the ischium. These survey corroborates the fact that PU is common among spinal cord inured and mobility compromised patients It is pertinent to note that in Oluwatosin et.al (1998) study, the focus was on the modalities of management and therefore the duration of admission before the ulcers developed was not discussed.

In 2008, an incidence survey in the US based on anatomical sites (Revis, 2008) noted that the hips and buttocks region accounted for 67% of all PUs, with ischial tuberosity, trochanter, and sacral locations being the most common. The lower extremities accounted for an additional 25% of all pressure sores, with malleolar, heel, patellar, and pre-tibial locations being most common. The study concluded that the remaining 8% of pressure sores may occur in any location exposed to long periods of uninterrupted pressure. The nose, chin, forehead, occiput, chest, back, and

elbow are among the infrequent sites for PU. However, no surface of the body can be considered immune to the effects of pressure.

2.7. Staging of Pressure Ulcers

Pressure ulcer staging is an assessment method used to classify pressure- related ulcers according to the extent of tissue destruction or the depth of the wound and basically communicates the extent of tissue loss at a single point in time. For accurate staging, necrotic tissue must first be removed to allow complete visualization of the ulcer bed, to also facilitate care planning and communication. According to the NPUAP (2008) staging represents observable changes in the wound bed but does not provide information with regards to wound history. It should therefore not be used to describe extent of healing (reversed staging). According to the panel a healing PU is usually filled with granulation tissue and becomes progressively shallower, but does not replace lost muscle, fat or dermis. Therefore, when a Stage IV ulcer has healed, the accurate description should be 'a healed Stage IV' and not 'a stage 0'. Furthermore, if a PU reopens in the same anatomical site, it retains its original staging. Example once stage IV is always stage IV (NPUAP, 2008).

The succinct description of the updated stages of PU following the 2007 Consensus Conference was as follows:

Deep Tissue Injury (DTI): The deep tissue injury is a pressure related injury which occurs in the deep tissue under an intact skin, which according to the NPUAP (2007) it is a purple or maroon localized area of discoloured intact skin or blood-filled blister, resulting from damage to the underlying soft tissue from pressure or shear. The area may be surrounded by tissue that is painful, firm, mushy, boggy, warmer or cooler, as compared to adjacent tissue. NPUAP (2007) further categorized blood –filled blisters as DTI because it is believed to represent a deeper level of injury than a serum-filled blister, even though the true depth of damage is not known. The panel observes that deep tissue injury maybe difficult to recognize in dark skin tones, thus in the dark skin tones, its development may begin as a thin blister over a dark wound bed which further evolves and becomes covered by thin eschar. This may either heal or it may rapidly progress with exposure of additional layers of tissue, even with optimum treatment (WOCN 2010).

Stage I: Unblanchable erythema of an intact skin which is assessed by gently pressing a finger on the reddened area of skin. Failure to blanch (colour changing to white followed by refilling of capillaries) is caused by bruised capillaries and escaped blood from the capillaries, indicating an underlying ischemic damage (Black et. al, 2007). Authors observed that stage I PU cannot be visually determined in persons with heavily pigmented skin. However, it should be borne in mind that stage I lesions already involve deeper tissue damage.

Stage II: Defined as partial thickness loss of dermis which presents as a shallow open ulcer with a red or pink wound bed. There is usually no slough in the wound bed. A stage II may also present as an intact or opened/ruptured serum-filled blister. Under this updated system, blood blisters are thought to be due to damage to tissues deeper than the dermis and are not to be classified as stage II (NPUAP 2009). Similarly, the presence of slough on PU bed also indicates damage to deeper tissues and such is not classified under stage II.

Stage III: In the updated definition, this stage describes a 'full thickness skin loss'; with visible subcutaneous fat without exposure of the bone, tendon, or muscle, where the presence of slough does not obscure the depth of tissue loss. There may be 'undermining and tunneling'. It is important to note that the depth of a stage III PU varies by anatomical location, being shallow on the bridge of the nose, ear, occiput and malleolus . In contrast, extremely deep stage III ulcers can occur in areas of significant adiposity.

Stage IV: Just like Stage III PU, a stage IV is a "full thickness tissue loss'. It differs from stage II in that there is significant exposure of bone, tendon and muscle , with or without slough or eschar on some parts of the wound bed. The bones may be directly palpable or visible. Stage IV PU is also associated with undermining and tunneling. The involvement of muscle fascia, bone and tendon results in osteomyelitis as a complication of stage IV PU. Due to the extent of tissues destruction, a Stage IV PU often requires a longer time to heal; and once healed, the ulcer site remains an area of risk because the scar tissue can retain only 40% tensile strength of the original tissue.

Unstageable Ulcers: This description applies to any ulcer with full thickness tissue loss, where the wound bed is covered by slough (yellow, tan, gray, green or brown) and/or eschar (tan, brown, or black) tissue (NPUAP 2009, WOCN 2010). However, the presence of necrotic tissue on the edge of the ulcer with bone at the base is classified as stage IV. It must be noted that

stable eschar (dry, intact without erythema or fluctuance) on the heels serves as the body's natural cover and should not be removed (NPUAP 2009, WOCN 2010)

2.8. Risk Assessment Scales for Pressure Ulcer

A central issue in prevention of PU is assessment of level of risk, and this requires the use of valid and reliable risk assessment scales. Literature is consistent about the preventability of PUs. However nursing negligence and poor standard of care are some of the factors that have been implicated in its development (Anthony, Johnson, Reynolds & Russel, 2000).

Risk Assessment Tools (RATs) also referred to as risk assessment scales have been devised by nurses on the basis of clinical experience, with numerical values assigned to various patient traits, such as level of incontinence. A total score produced from the sum of these values indicates the level of risk (Papanikolaou, Lyne & Lycett, 2003). It should be explained that risk assessment scores indicate a patient's predisposition to PU development and not absolute risk prediction, as preventive interventions are instituted as soon as risk factors are identified. The effectiveness of these tools in predicting PU development depends on its sensitivity, specificity, reliability and validity, with good predictive value. Lindgren, Krantz and Ek (2002) added that such tools must be easily applicable in clinical practice. A total score produced from the sum of these values indicate patients' level of risk. These numerical tools are helpful in alerting nurses to the existence of risk factors.

Common risk assessment tools which have been used in clinical practice include: Norton Scale, Braden Scale, and Waterlow scale. Others are Gosnell Scale and Knoll Scale. Some of these scales are peculiar to some countries while others have been modified to suit specific countries and settings. For example, while Waterlow is the scale of choice in the United Kingdom, a modified version of Norton scale is used in Sweden (Lindgren, et al, 2002).

Norton Scale: This was developed based on the clinical experience of the authors in the early 1960s, (Norton et. al, 1979) cited in Lindgren et. al, (2002) for the prediction of PU development among the elderly patients. Five variables are assessed in the Norton Scale. These are general physical condition, mental state, activity, mobility and incontinence. The maximum score on the scale is 20, with cut-off of greater than 14 or 16. Some studies have criticized the

tool both for over prediction and under prediction of patients risk for PU development (Goldstone & Goldstone, 1982 & Bridel 1993 cited in Lindgren et al(2002).

Braden Scale: Braden scale (Braden and Bergstrom, 1987) was developed following an overview of literature to identify fundamental causes of PU. It is the most commonly used of all the scales and translated into many languages. The authors identified two fundamental issues: duration and intensity of pressure and tissue tolerance to pressure. The scale is composed of six subscales: activity, mobility, nutritional status, moisture, sensory perception, friction and shear. The subscales of sensory perception, mobility and activity address clinical situations which predispose the patient to intense and prolonged pressure, while moisture, nutrition and shear/friction address clinical situations that alter tissue tolerance for pressure. Each subscale contains a numerical range of scores, with 1 being the lowest score possible. The maximum score is 23 and cut-off score is <14 and <18. A low numerical score means that the patient is at high risk for developing PU.

The predictive validity of Braden scale has been critically examined and used in different studies in various populations. The sensitivity is within the range of 38% and 100%, and specificity between 60% and 92%. For example, the predictive validity of the Braden scale among 7790 intensive care patients revealed that a cutoff score of 16 on the Braden scale had a sensitivity of 0.954, specificity of 0.207, positive predictive value of 0.114, and negative predictive value of 0.977 (Hyun, Vermillion, Newton et.al 2013). The study concluded that the Braden scale was insufficient in predictive validity and therefore was inaccurate in discriminating intensive care unit patients at risk for developing pressure ulcer. This suggest that the Braden scale was not adequate to predict the development of PU among patients in intensive care units. It may also infer that predictability of Braden scale is dependent on the patient population, whose characteristics can be assessed by the Braden subscales. Table 2.1 shows the Braden scale.

Table 2.1. Braden Scale

Sensory perception: meaningful response to pressure – related discomfort	**1. Completely limited: (** Unresponsive to painful stimuli or limited ability to feel pain	**2 .Very Limited**: Responsive only to painful stimuli OR gas sensory impairment	**3. Slightly limited:** responds to verbal commands but can't communicate.	**4. No impairment:** responds to verbal commands. No sensory impairment.	Score
Moisture: Degree to which skin is wet	**1.Constantly moist:** by perspiration, urine etc. dampness is detected every time pt is turned	**2. Very moist:** skin is often but not always moist. Linen changed at least once per shift.	**3. Occasionally moist:** Linen change once per day.	4. **Rarely Moist:** skin usually dry. Linen change at routine interval.	
Activity: Degree of physical activity	**1. Bedfast:** Confined to bed	**2.Chair fast:** Limited ability to walk, cannot bear own weight/ or must be assisted into chair/wheel chair	**3 Walks occasionally:** walks occasionally during day for very short distance, with or without assistance. Spends more time in bed	**4. Walks frequently:** Walks outside room at least 2ce dly or inside room at once every 2hrs.	
Mobility: Ability to change and control body position	**1.Completely immobile:** Does not make even slight changes in body or extremity position without assistance	**2. Very limited:** occasional slight changes in body or extremity position but not independent frequent changes.	**3. Slightly limited:** Makes frequent though slight changes in body or extremity position independently.	**4. No Limitations:** Makes major and frequent changes	
Nutrition: Usual food intake pattern	**1 Very Poor:** Never eats a complete meal. Rarely eats more than ½ of any food offered. OR NPO. On IV fluids	**2.Probably inadequate:** Rarely eats a complete meal. Generally eats only ½ of any food offered. OR on tube feeding	**3. Adequate:** Eats over ½ of most meals. Eats a total of 4 servings of protein(meat, dairy product per day) Or on tube feeding which probable meets most nutritional needs.	**4 Excellent:** Eats most every meal. Never refuses meal	
Friction/ Shear:	**1 Problem:** Requires moderate to maximum assistance in moving. Impossible to move without sliding	**2.Potential problem:** Moves feebly but requires minimum assistance. Skin probably slides to some extent against chair, sheets etc.	**3. No apparent problem:** Moves in bed or chair independently.		
Results	**15-18 Low risk. 13-14 Moderate risk. 10-12 High risk. 9 and below: Very high risk.** ***If total score is 14 or less, initiate PU Prevention Plan.***				

Source: Braden & Blanchard(2007)

Waterlow Scale: This is a comprehensive scale developed in the 1980s, which recognizes the multifactorial etiology of PU. It consists of six subscales, each dealing with a risk factor related to the presence of PUs and four 'special risk' groups specifying the presence of high risk factors. This scale measures level of risk for pressure ulcer under the following parameters: age, sex, height/weight, body build, appetite, continence of feaces and urine, mobility, skin appearance in risk areas, special risk. Table 2.2 shows the Waterlow scale

Table 2.2. Waterlow scale

BUILD/WEIGHT FOR HEIGHT	★
AVERAGE	0
ABOVE AVERAGE	1
OBESE	2
BELOW AVERAGE	3

CONTINENCE	★
COMPLETE/ CATHETERISED	0
OCCASION INCONT	1
CATH/INCONTINENT OF FAECES	2
DOUBLY INCONT	3

SKIN TYPE VISUAL VISUAL RISK AREAS	★
HEALTHY	0
TISSUE PAPER	1
DRY	1
OEDEMATOUS	1
CLAMMY (TEMP ↑)	1
DISCOLOURED	2
BROKEN/SPOT	3

MOBILITY	★
FULLY	0
RESTLESS/FIDGETY	1
APATHETIC	2
RESTRICTED	3
INERT/TRACTION	4
CHAIRBOUND	5

SEX AGE	★
MALE	1
FEMALE	2
14 - 49	1
50 - 64	2
65 - 74	3
75 - 80	4
81+	5

APPETITE	★
AVERAGE	0
POOR	1
N.G. TUBE/ FLUIDS ONLY	2
NBM/ANOREXIC	3

SPECIAL RISKS	★
TISSUE MALNUTRITION	★
eg: TERMINAL CACHEXIA	8
CARDIAC FAILURE	5
PERIPHERAL VASCULAR DISEASE	5
ANAEMIA	2
SMOKING	1
NEUROLOGICAL DEFICIT	★
eg: DIABETES, M.S, CVA, MOTOR/SENSORY PARAPLEGIA	4 - 6
MAJOR SURGERY/TRAUMA	★
ORTHOPAEDIC BELOW WAIST, SPINAL	5
ON TABLE > 2 HOURS	5
MEDICATION	★
CYTOTOXICS, HIGH DOSE STEROIDS ANTI - INFLAMMATORY	4

SCORE	10 + AT RISK	15 + HIGH RISK	20 + VERY HIGH RISK

© J Waterlow 1991 Revised March 1992
OBTAINABLE FROM: NEWTONS, CURLAND, TAUNTON, TA3 5SG

2.9. Evidence-Based Practices for Prevention of Pressure Ulcer

Thirty-four years ago, precisely in 1975, at the first National conference on PU held in the UK, one of the presenters stated that although practitioners know how to prevent bedsores, maintain circulation and avoid prolonged pressure, the challenges they face are mainly the logistics of achieving these outcomes. The questions arising from this statement today is whether logistics of preventing PU is the a problem in the healthcare system. Are there still logistic problems militating against PU prevention especially in Nigeria? Do we as care providers, have the skills and expertise to avoid bedsores and tissue necrosis? Once a patient is identified as being at risk for PU, appropriate preventive interventions should be planned, implemented and evaluated. Failure to do so could be seen as negligence (Dealey, 1997). A range of evidence-based preventive interventions requiring multidisciplinary approach are described by the NPUAP and the EPUAP (2009). Other international organizations which have corroborated the recommendations include the WOCN (2010). These recommendations are:

Risk Assessment: It is recommended that a head-to-toe skin assessment be carried out for all clients on admission, and thereafter daily for those identified at risk for skin breakdown. Particular attention should be paid to vulnerable areas, especially over bony prominences. The patient's level of risk should be determined using a combination of clinician's judgment in conjunction with a reliable risk assessment tool and visual inspection of the skin. The Braden scale for predicting risk for PU has been tested for reliability and validity (NPUAP-EPUAP 2009, WOCN 2010). Interventions should therefore be based on identified intrinsic and extrinsic factors and those identified by a risk assessment tool. Patients who are either bed/or chair-fast or surgical patients should be assessed for pressure, friction and shear in all positions and during lifting, turning and positioning. All assessment data must be properly documented at time of assessment and during reassessment, which should be followed by an individualized plan of care based on individualized assessment data and the client's goals. This must be done in partnership with the client and significant others . Repositioning schedule should be developed to minimize pressure in clients with identified risk for PU development.

Other recommendations under risk assessment include proper positioning, transferring and turning techniques. This can be achieved through consultation with physiotherapists. Devices to reduce friction and shear and to optimize client independence should be supported. The impact

of pain on mobility and activity should be considered. Therefore, pain control measures in the form of medication, therapeutic positioning, support surfaces and other non-pharmacological interventions should be considered. Pain should be monitored on an on-going basis using a valid pain assessment tool. Evidence based recommendations strongly discourage the massage of bony prominences of at –risk patients. Furthermore, clients at risk of PU development should not remain on a standard mattress, rather a replacement mattress with low interface pressure should be used. Similarly in operating room (OR), high risk patients should be placed on pressure-relieving surfaces intra-operatively to prevent PU development post surgery.

Management of Tissue Load: Pressure damage results from exposure of tissues to pressure overtime and the severity of damage is a function of the duration of pressure, which is balanced by the ability of the tissue to tolerate damage (Hess 2008). This implies that in preventing pressure damage, management is directed at both reducing the mechanical load on the tissues either by relieving the pressure or by reducing the time at which pressure is applied and optimizing the skin's ability to tolerate pressure. Strategies to achieve this include repositioning by turning to rotate pressure prone areas, using repositioning devices for both bed and chair-bound patients. The repositioning standard should be individualized, suggesting that the frequency should be based on the result of skin inspection (NPUAP 2009). Patients with observed persistent discoloration should be placed on more frequent repositioning schedule (Hess 2008), even though the two hourly turning has long been the recommendation. There are evidences that a change of position spreads tissue load and thus reduce the duration of pressure for a given area NPUAP/EPUAP 2009, WOCN 2010). Furthermore, pillows and foams can be used as wedges to reduce contact between bony prominences and support surfaces, thereby reducing the load/ direct pressure on the tissues. Other helpful devices to promote independent positioning for patients who are able to assist with mobility are trapeze bars, transfer boards, and bed rails. There is further agreement that donut-type devices should not be used for pressure redistribution. WOCN also recommends against foam rings, foam cut-outs, and synthetic sheepskin.

These organizations (NPUAP/EPUAP, WOCN) recommend that head- of- beds should not be higher than the lowest elevation (30 degrees) to reduce effect of shearing force, but must however, be consistent with the medical condition of the patient. Lifting devices should be used

to reduce friction, which can occur when patients are dragged across the bed during change of position or transfer. Special mattresses like clinitron, low air loss, water, ripple mattresses and many others should be provided. WOCN continues to note that compared with standard hospital mattresses, alternating or dynamic mattresses and oscillating air-flotation beds have been associated with a lower incidence of pressure ulcers. They added that high specification foam has been shown to be effective in decreasing the incidence of pressure ulcers in high-risk patients. According to the organization, the choice of support surface should be dependent on the following factors: skin surface tension, shear force, temperature, humidity, the magnitude and duration of interface pressure, pressure and blood flow distribution, and adult versus pediatric patients.

In respect of heel pressure ulcers, the consensus is that heel protection devices should completely offload (float) the heel. WOCN noted that no specific support surface or heel product has proven to be outstandingly superior in decreasing pressure at the heel. They recommend against the use of synthetic sheep skin, bunny boots, rigid splints, IV bags or water-filled gloves, and rolled towels or sheets. WOCN adds that pillows or foam cushions can be placed longitudinally under calves with the heel suspended in air, to decrease heel interface pressure.

Figure 2.4

30^{o} tilt in recumbent position. Source: Johnstone &Hodgson(2009).

Skin Care: Interventions relating to skin arise from the need to minimize factors that reduce tissue tolerance to pressure. Evidence suggests that skin integrity is degraded with poor hygiene and extreme moisture, where too much moisture results in skin maceration while too little results in dry skin, which is susceptible to cracking. Recommendations from NPUAP-EPUAP (2009) and WOCN(2010) for skin care include the need for assessment of the skin of 'at risk patients' on admission and after prolonged procedures on a couch or hardened surfaces. Pressure points particularly over bony prominences should be examined for colour changes and any skin change should be documented. Adaptation of skin assessment to skin tones is recommended (Ayello &Sibbald 2012) as changes in skin color may not be readily visible in dark skin tones. It is therefore suggested that other parameters should be assessed for in the dark skin persons, such as palpating for pain, temperature change (over area under pressure), edema and hardness .

Maintenance of hygiene especially in incontinent patient is recommended, to control the source of moisture. The organizations also agree that in managing moisture, harsh cleansing agents should be avoided as this may irritate and dry the skin, rather lotions can be used after bathing. The use of perineal skin cleansers has been found to be more effective for the prevention and treatment of incontinence associated dermatitis (IAD), than traditional soap and water. Evidence suggests that bar soap tends to dry the skin and create an alkaline pH on the epidermal skin surface, thereby increasing the risk of tissue injury (Hartford Institute for Geriatric Nursing (HIGN) 2008). It is noted also that vigorous cleaning with wash clothes can lead to erosion of the epidermis (HIGN) 2008), therefore skin cleansing should be performed using a smoothly woven clothe to prevent skin erosion. In addition, nutritional assessment of the patients at risk should be conducted on admission and diet should be monitored for adequate protein intake, as nutritional status influence the condition of the skin.

Interventions to Reduce Friction and Shear: Progress has been made towards assessing the effect of shear and friction and how it can be reduced. With this in mind, interventions such as massaging of bony prominences have been largely discouraged in most guidelines for PU prevention (NPUAP, 2009; WOCN 2010; Butcher &Thompson, 2010). Clinicians are advised to exercise care when repositioning patients to minimize the effect of shear forces, as such they are encouraged to lift rather than drag patients across the bed. Appliances to aid lifting are suggested (Australian Wound Management Association (AWMA),

2001), such as use of lift clothes. Some authors have advocated the use of preventive dressings and skin sealants to help reduce friction and shear. However, work in this area has been at best sporadic (AWMA, 2001; Butcher, 2010). Its effectiveness, according to Butcher and Thompson (2010) is akin to the use of wound plaster to prevent a new footwear from rubbing and producing painful blisters. In a report of a case series of the effectiveness of absorbent soft silicone foam dressing (Brindle 2009) to prevent PU in a surgical trauma ICU, the baseline PU incidence in the ICU was between 5 to 24%. During a 3-month period, 93 patients were admitted, of these 41 were identified as being at high risk for PU and were treated with silicone foam dressing. Reports indicated that there was zero incidences of sacral ulcers in patients who were managed with foam dressing. The authors concluded that dressings have qualities which enhance prevention of PU. The qualities were highlighted as follows:

1. Excellent absorptive capacity
2. An atraumatic adhesion technology
3. An occlusive outer covering
4. A shape and size that was able to cover the sacrum and separate the gluteal folds.

2.10. Outcomes of Pressure Ulcer

Pressure ulcers have far reaching negative impact on persons living with it. This goes beyond the cost of treatment , to include suffering, pain, disfigurement , change in body image and overall effect on quality of life (Bush 2002), resulting in fear, isolation and anxiety regarding wound healing. For the elderly persons, Moore and Cowman (2007) reported that the risk of dying with PUs is three times greater than those without such problems. Other studies confirm that the incidence of death within one year is high among patients with PU (Thomas, Goode & Tarquine 1996).

In a study of 19,981 nursing home residents (Berlowitz in Brown, 2003), the authors noted that among the elderly, the increased risk of death is largely related to the frailty and high disease burden of the residents, and not a direct result of PU. Furthermore, the authors maintained that the elderly residents who sustained full thickness PU also suffer other health problems associated with skin failure, therefore the cause of death is not simply as a result of a ‘failure to turn’ the patients. This suggest that the associated mortality among the elderly patients with

PU cannot be entirely attributed to PU development, but also the accompanying diseases tend to worsen the outcome.

In another report, osteomyelitis was observed as an outcome of PU occurrence, particularly in infected PUs, which sometimes maybe difficult to diagnose clinically (Yoshikawa, Livesley & Chow 2002), especially in the elderly because of associated comorbidities. This is because the typical presentation maybe a wound infection with or without systemic manifestations of fever, leukocytosis, and other signs of sepsis. Yoshikawa et.al (2002) further observed that bacteremia in infected PU usually presents with signs of systemic inflammatory response, including fever, chills, confusion, and hypotension, with high mortality rate, suggesting that clinical manifestation of infection can be extremely variable.

Several studies have examined the cost and prevalence of PU but very few have considered the experiences of people living with PUs. The report of a qualitative experiences of people with existing and healed PU (Lagemo et.al 2000 cited in Bush 2002), presents several themes which describes the experiences of persons living with PUs. The emerging themes were summarized as ; psychospiritual impact , the need for knowledge and understanding of pressure ulcers; and experience of grieving particularly among those with spinal cord injury. This suggest that PU has impact on physical, emotional, social and spiritual lives of the sufferers and therefore underscores the importance of timely preventive interventions.

Despite advances in preventive interventions such as pressure–reduction surfaces, risk assessment scales and improved knowledge on preventive techniques, literature maintains that PU continues to occur in healthcare facilities (Brown, 2003), as shown by high incidence and prevalence data . Some authorities have observed that collection and analysis of PU healing and mortality outcomes is a missing component of overall PU quality assurance data. This is attributed to the difficulty in long term data collection and documentation which is time consuming and expensive, although such data is vital. Brown (2003) suggests the need to establish a framework for consistent reporting of long-term PU outcome. Healthcare providers require clear guidelines to determine when the development of PU is an avoidable occurrence or simply another failing organ system. Johnston and Hodgson (2009) summarized the outcome of PU to include the following: lack of privacy, changes in body image, loss of control and

independence, increased pain, social isolation, malodor, and growing limitation on activity and mobility, suggesting a state of suffering and loss of independence.

2.11. Empirical Studies

Educational Programme and Pressure Ulcer Prevention

Pressure ulcer prevention program lies within the domain of nursing practice as skin assessment and care are taught as fundamental elements in the nursing education curricula. This is emphasized by Myra Levine in her theory of conservative principles, a model to guide nursing practice. The theorist explains that conservation of structural integrity is of significance to maintaining health or wholeness. This is achievable with nursing interventions. Nurses assess patients' skin on admission and at the bedside, noting subtle changes which require nursing interventions to prevent break in tissue integrity. Such assessments and subsequent clinical decisions to implement specific interventions are determined by nurses' critical thinking and cognitive skills regarding PU prevention.

Empirical evidence of the effectiveness of educational programme in preventing PU is demonstrated in literature. Altun and Ayten, (2011) examined the impact of a lecture –based interactive workshop on PU prevention. Findings was reported to have improved nurses knowledge of PU prevention and allowed participants to overcome deficiencies.

In Brazil, Miyazaki, Caliri & Santos (2010) conducted a descriptive and exploratory study of 386 nursing professionals. The study examined knowledge of PU prevention and found a deficiency in use of Braden scale among the participants. Authors concluded that an educational programme on the use of the Braden scale should be a priority in PU prevention programmes because valid scales are considered essential in PU prevention to predict those who are more likely to develop ulcers, thus facilitating an early individualized plan of care.

Tweed and Tweed (2008) measured the knowledge of PU prevention among intensive care nurses after an educational program. Study concluded that knowledge of nurses to prevent and manage PU improved with an educational programme, with a mean score 89%. However, the mean baseline score (84%) did not differ significantly with the post test score. When the nurses were evaluated after 20 weeks, the score was reported to have reduced to baseline. The findings suggest that the educational program was not effective in improving the knowledge of participants from baseline to post intervention.

Furthermore, Labiak (2008) sought to determine whether or not implementing a PU educational intervention among nursing staff members on an inpatient orthopedics unit would achieve the following objectives: improve staff knowledge of PU prevention and treatment, improve staff self-assessed attitudes towards PU prevention and treatment, decrease the incidence of inpatient PUs, and decreased the cost of managing PU in the facility. Results were ascertained by comparing pre-intervention and post-intervention unit PU incidence rates and costs, and by comparing staff self-assessed PU knowledge and attitudes via pretest and posttest surveys. Both the incidence and the overall severity of facility–acquired PUs dropped from pre-intervention to post-intervention. Although general unit-based patient acuity levels were higher during the post-intervention period, direct nursing care hours were less. The total costs of hospitalization incurred by patients with PUs were higher during the pre-intervention period, as was the average length of stay (LOS). While staff PU knowledge did not demonstrate statistically significant improvement from pre-intervention to post-intervention stage, the staff attitudes regarding their ability to effectively prevent and treat PUs improved. The study concluded that providing ongoing education to nursing staff with advanced wound care experts is an easily replicable and cost-effective means to contain costs and assure quality care.

The report of a unit-based PU prevention programme in a 500-beded hospital (Robinson, Gloeckner, Bush et.al, 2008), suggested an indication for development of unit-based skin care resource nurses to provide a focused effort towards reducing the incidence of PU. Authors noted that more frequent measurement of PU incidence provided opportunity to make changes which can improve care in a timely manner ; thereby facilitating teachable moments. In another study, McQueen, MacLennan, McDiarmid and Gold (2005) opined that knowledge and skill are prerequisite for good practice, and can be obtained from continuing professional development and life-long learning. Accordingly, these are well established concepts within healthcare settings to promote a continuous process of learning in practice, with the sole aim of improving patient care.

In Canada, Sinclair, Loraine and Berwiczonek et. al (2004), conducted a quasi-experimental pretest-posttest study to assess the knowledge level for PU prevention among two levels of nursing staff (RN= 595, LPN= 59), using the Pressure Ulcer Knowledge Test (PUKT) by Pierper and Motts (1995). The findings indicated higher scores following educational

intervention, having been 42.3% at pretest and 60.5% after an educational programme. The study concluded that the evidence-based PU education was effective in increasing Registered Nurses' and Licensed Practiced Nurses' knowledge, and was presumed to increase consistency of the knowledge and awareness of practice standards.

In a small quasi-experimental, pretest-posttest study among Swedish nurses (N=20) to assess the effectiveness of a PU educational programme, Gunningberg (2004) reported an improved knowledge among study participants specifically in PU prevention, documentation and ward routines immediately after the programme. These were reported to have been unsatisfactory before the educational program. However, the eight-months follow-up result showed that 11 nurses (55%) had implemented new ward routines but documentation was still lacking after the programme. The study concluded that educational programme succeeded in encouraging and empowering the nurses to change clinical practice.

In an earlier study among American nurses (N=228) from two hospitals from where the PUKT tool originated, Pieper and Mott (1995) reported a score of 71.1% of correct responses among respondents. In that report, the knowledge level was significantly higher among nurses who had exposure to PU lectures or who had read PU related articles the year before the test, suggesting that education programme can improve knowledge of PU prevention.

Based on the findings from the above studies, it can be concluded that educational programme is effective to improve PU preventive knowledge, as well as nurses' attitude towards PU prevention. Findings from studies also indicated positive changes in practices such as risk assessment and documentation . It should be observed that these studies were conducted in developed countries. There is however a paucity of similar studies in Nigeria. Few existing studies among Nigerian nurses utilized descriptive research designs of nurses' knowledge of risk factors for PU, no interventional study that was conducted in Nigeria was identified. This is the impetus for this present study.

2.12. Review of Related Concepts

Some concepts and issues which are considered relevant to the discourse on PU prevention such as patients' quality and safety, organizational policies with regards to PU prevention, the legal landscape and implications for PU development, as well as nurses' clinical judgment and decision making are discussed below.

2.13. Quality and Patient Safety: Prevention of PU is a significant indicator of quality of care received by patients in any organization. Quality is embedded in safety. Nurses are critical to the surveillance and coordination that reduce adverse outcomes in care environment. The large amount of time spent by nurses in providing direct patient care and the knowledge of the day-to-day issues involved in the delivery of care necessitate that nursing assumes a leading role in hospital safety and quality improvement initiatives (Gantz, Sorenson, & Howard, 2003).

Patient safety is the cornerstone of high quality care. This has become more critical in the current changing health care terrain. Consumers of healthcare are constantly demanding for quality and cost effective services, thereby placing a demand on the healthcare providers to maintain a culture of safety and quality in the organization. For decades nurses, have been part of health care system that hides mistakes, blames individuals for errors and ignores the roles of the complex systems in producing errors. Nelson and Powell-Cope (2006) opined that nurses have a significant role in reshaping the healthcare in order to make it safer for individuals and families, thus the concept of patient safety is very closely linked to quality of care .

According to the Institute of Medicine (IOM) (2008), safety is the foundation upon which all aspects of quality care is built. Earlier works by the American Academy of Nursing Expert Panel on Quality Health focused on the following positive indicators of high-quality care that are sensitive to nursing input: achievement of appropriate self-care, demonstration of health-promoting behaviours, health-related quality of life, perception of being well cared for, and symptom management to criterion (Mitchel & Soule 2008). Authors explained further that morbidity and adverse events were considered negative outcomes of interest that represented the integration of multiple provider inputs. The most recent IOM work to identify the components of quality care for the 21st century is centred on the conceptual components of quality rather than the measured indicators: safe quality care, effective, patient-centred, timely, efficient, and equitable care, thus reiterating the fact that safety is the bedrock upon which all other aspects of quality care are built. It is interesting to note that an attempt to define the concept of quality has been on for years.

Literature indicated that ancient philosophers such as Aristotle and Plato contemplated the attributes of quality in an attempt to provide a definition. Quality was one of the greatest ideas of the Western world. Adler and Goman (1952) and Harteloh (2003) reviewed multiple

conceptualizations of quality and concluded with a very abstract definition that quality is an optimal balance between possibilities realized and a framework of norms and values. This conceptual definition reflects the fact that quality is an abstraction rather than a discrete entity. It is constructed based on an interaction among relevant actors who agree about standards (the norms and values) and components (the possibilities).

The concept of patient safety is defined as freedom from accidental injury (Nell & Powell-Cope, 2006). Errors in healthcare can result to an adverse event, which is defined as an unintentional error that produces negative consequences for the patients, including falls, fall-related injuries (hip fracture), or pressure ulcer (Institute of Medicine (IOM), 2001). On the other hand, Shojania, Duncan and McDonald et.al (2001) noted that patient safety practices have been defined as those that reduce the risk of adverse events related to exposure to medical care across a range of diagnoses or conditions. This definition is concrete but quite incomplete, because so many practices have not been well studied with respect to their effectiveness in preventing or ameliorating harm. However, some practices which are considered to have sufficient evidence to include in the category of patient safety practices are listed below:

- Appropriate use of prophylaxis to prevent venous thromboembolism in patients at risk
- Appropriate use of bedding materials to prevent pressure sores
- Use of perioperative beta-blockers in appropriate patients to prevent morbidity and mortality
- Use of maximum sterile barriers while placing central intravenous catheters to prevent infections
- Appropriate use of antibiotic prophylaxis in surgical patients to prevent postoperative infections
- Asking that patients recall and restate what they have been told during the informed-consent process to verify their understanding
- Continuous aspiration of sub-glottic secretions to prevent ventilator-associated pneumonia
- Use of real-time ultrasound guidance during central line insertion to prevent complications

- Patient self-management for warfarin (Coumadin) to achieve appropriate outpatient anticoagulation and prevent complications
- Appropriate provision of nutrition, with a particular emphasis on early enteral nutrition in critically ill and surgical patients, to prevent complications
- Use of antibiotic-impregnated central venous catheters to prevent catheter-related infections (Mitchell & Soule 2008).

2.14. The Role of Nursing in Maintaining Quality of Care through patient Safety

Historically, nursing had been recognized as a key player with regards to obtaining quality care through patient safety. This was clearly demonstrated by Florence Nightingale in 1855 (Mitchell & Soule 2008), when she through her astute nursing measures of hygiene, infection control measures and environmental influence successfully reduced the mortality rate among the British soldiers in the Creamia. Nightingale was also credited with creating the world's first performance measures of hospitals in 1859(Mitchell & Soule 2008**).** Later in the 1970s, Wandelt (1976) in an attempt to define relevant concepts to quality care , noted that the fundamental definitions of quality characterize degrees of excellence, with standards referring to a general agreement of how things should be (to be considered of high quality). About the same time too, Lang (1976) proposed a quality assurance model that has endured with its foundation of societal and professional values, as well as the most current scientific knowledge. This had been for almost two decades before the IOM's definition of quality of care was put forth. It should be noted also that, in the past, the role of nursing in patient safety had been viewed in a narrow spectrum of patient care, such as avoiding medication errors and preventing patient falls. While these dimensions of safety remain important within the nursing purview, the breadth and the depth of patient safety and quality improvement are far greater. The most critical contribution of nursing to patient safety, in any setting, is the ability to coordinate and integrate the multiple aspects of quality within the care directly provided by nursing and across the care delivered by others in the setting. This integrative function is probably a component of the oft-repeated finding that richer staffing (greater percentage of registered nurses to other nursing staff) is associated with fewer complications and lower mortality (Tourangeau & Cranley, 2006). This suggests that safety is related to the roles of professional nurses in integrating care (which includes interception of errors by others/near misses), as well as the monitoring and surveillance

that identifies hazards and patient deterioration before they become errors and adverse events (Mitchell & Lang, 2004).

2.15. Policies on PU in Different Countries: Several countries of the world have recognized the negative effect of PU on patients and have therefore developed policies for its prevention. In the UK for example, some Trusts under the NHS have policies and guidelines with the aim of clarifying the responsibilities and accountability of the multidisciplinary team involved in PU prevention and management, as well as to clearly set out the principles which staff under the Trust ought to follow.

The Calderdale and Hudderfield NHS Foundation Trust described PU as an ever-increasing burden on the NHS finances, noting that the treatment of PU constitutes 4% of the NHS yearly budget, amounting to 1.4 to 2.1 billion pounds per year, suggesting that the cost of treating PU was much higher than prevention. Some healthcare organizations in the UK are using PU incidences data to provide evidence of quality care provided for their patients, suggesting that PU prevention is an important and integral component of quality care. Clarkson (2007) observed that in the UK, PU is increasingly being linked to elder abuse and neglect. The Calderdale and Hudderfield NHS Foundation Trust policies and guidelines on PU prevention are well described and are expected to be read in conjunction with the following local and national guidelines and procedures:

i. The Wound Management Formulary (2008)
ii. Infection Control Policies
iii. Moving and handling policy
iv. Safeguarding Adults Guidelines,
v. National Institute for Clinical Excellence Guidelines on Pressure Ulcer Prevention and Management (2001 & 2005),
vi. The European Pressure Ulcer Advisory Panel guidelines on Pressure Ulcer
vii. Prevention and Management, and
viii. The Tissue Viability Society (2009) Seating and Pressure Ulcers: Clinical Practice guidelines.

According to the NHS Trust, the aim is to prevent all PUs and maintain the development of hospital acquired PUs to below 1% of hospitals admissions. Therefore, for all patients receiving care under the Calderdale and Huddersfield NHS Foundation Trust, their risk for PU will be

assessed on admission and appropriate preventive and/or treatment will be provided. The objectives of the policy are to:

- Raise awareness of PU prevention across the Trust
- Promote a consistent approach to care through best evidence on the prevention and management of pressure ulcers.
- Standardize the assessment and management of individuals who are at risk of developing pressure ulcers or who have existing pressure ulcers.
- Ensure that staff can recognize the factors that may lead to pressure ulcer development and are aware of actions that can be taken to reduce or manage the risk of PU developing.
- Reduce the incidence of PUs within the Trust by implementing individualized treatment plans based upon a comprehensive assessment.
- Effectively manage existing PUs and to ensure that appropriate reporting procedures are used in order to ensure the safety of patients and to learn from patient experiences.
- Support patients, families, caregivers and health care professionals with a framework for the prevention and management of PUs.
- Clarify and define professional responsibilities.
- Enable clinical staff to educate patients and caregivers in the prevention of PUs and the appropriate use of preventative equipment.
- Ensure that pressure-redistributing equipment is used appropriately and that staff are aware of Infection Control Policies and the Moving and Handling Policy regarding the safe use of this equipment. (Calderdale and Hudderfield NHS Foundation Trust 2009)

A similar organization: the Aintree University Hospital NHS Foundation Trust, had in 2010 developed a policy for PU prevention for patients under their care and the policy also emphasizes awareness of PU prevention among staff working in the Trust. The policy describes seven key principles for PU prevention such as risk assessment, preventative measures, such as manual repositioning of the patient, use of specialized equipment/seating, nutrition, dressings and treatment, monitoring and documentation and education. The policy further states that all hospital acquired PU stage 2 and above should be documented as a clinical incident and all patients with a stage 3 or above PU are to be referred to the Clinical Nurse Specialist-Tissue Viability. Each patient/carer under Aintree University Hospital NHS Foundation Trust is given

a patient educational booklet on PU prevention and is also kept informed in all stages of his or her care. The use of specialized equipment is key to treatment of at risk patients and the decision for use is based on the result of the risk assessment conducted. The Clinical Nurse Specialist-Tissue Viability must be contacted when the need for such specialized equipments is considered. Policy emphasized that the need for repositioning and the use of pressure relieving equipment should be reviewed on regular basis as this is expected to change in response to altered level of risks, condition or patient needs.

In the USA, PU prevention presents a major challenge to acute care and is a focus for quality improvement. The Agency for Healthcare Research and Quality (AHRQ) noted that, each year, more than 2.5 million people in the United States develop PUs. These skin lesions bring pain, associated risk for serious infection, and increased health care utilization. The Centers for Medicare & Medicaid (CMS) no longer provides additional reimbursement to hospitals to care for a patient who acquired a PU while under the hospital's care because PU is included under the preventable hospital acquired conditions. Suddaby in Wurster (2007) noted that the hallmark of quality nursing care is excellent skin care, thus hospitals in America evaluate themselves for quality care, based on the prevalence of skin breakdown. Furthermore, the increasing demand of proof of quality patient care from legislators, payers, business leaders, and the public made the American Nurses association (ANA) to respond in 1995 with the Safety and Quality Initiative. This initiative resulted in the development of a National Nursing Database which measures the impact of nursing care on patient outcomes, driven by evidence-based practice. In support of the ANA standard, Medicare developed a programme referred to as pay-for-performance (P4P), which was designed to reward providers for improving quality of care and exceeding specific benchmarks in regards to PUs, using the National Database of Nursing Quality Indicators (NDNQI) (Haberfelde, Bedecarre,& Buffum, 2005).

In 2008, the Joint Commission National Patient Safety Goal and Agency for Health Research and Quality: Healthy People (2010), noted that the prevalence of PU was number two on the National Quality Forum's ' 15 National Voluntary Consensus Standards on Nurse-Sensitive Care'. This perhaps prompted the adoption of the slogan ' *zero tolerance for pressure ulcers'*, whereby nurses as primary caregivers shoulder the burden of preventing PU in hospitalized patients. To achieve the goal of zero tolerance for PU, the Agency for Healthcare Research and Quality through the ACTION (Accelerating Change and Transformation In

Organizations and Networks) programme developed a toolkit with content drawn on literature on best practices in PU prevention and included both validated and newly developed tools. The policy recognizes that PU prevention requires multidisciplinary collaboration, involving teams which are focused on developing and implementing the care plan. This suggests an organizational culture and operational practices that promote teamwork and communication, as well as individual expertise, in order to achieve the desired goal.

2.16. Legal Issues in PU Prevention: Preventing PU can be nursing sensitive, and this explains why nursing more often than not stands indicted when PU occurs. Annually in the US, 2.5 million Americans are treated in acute care facilities for PU, and this represents a huge cost and has in recent times been the focus of litigation and a source of income for attorneys (Beitz, 2012). From the legal perspective, PU is termed a 'reasonably preventable' problem through application of evidence-based guidelines (NPUAP /EPUAP 2009) . This statement has been interpreted to imply that PU is not always preventable. Baranosky (2010) explained that in view of the prevailing legal policies surrounding PU occurrence in the US, it is more important now, more than ever for healthcare providers to fully understand, appreciate and adapt to the legal issues that arise from the care of patients with pressure ulcers. This is because the interrelationship between medical-decision-making, reimbursement and legal issues has never been greater. Caregivers need to stay within their scope of practice with regard to PU assessment & documentation.

The International Wound Care Experts (Ayello et.al, 2009) had in 2009 issued a white paper on the legal issues regarding the care of PUs. The experts noted that lawsuits over PUs are becoming increasingly common in both acute and long term care settings, with claims per occupied bed increasing at an annual rate of 14 percent, and the average court settlement rising more than $250,000. The authors noted that when the treatment and prevention of PUs comes under legal scrutiny, it is often alleged as negligence. This is buttressed by the experience of a clinical nurse specialist in wound care in the US (Fowler, 2009) , who in the description of her deposition ordeal concluded that common allegations against nurses in a lawsuit include among others; failure to follow a standard of care, failure to communicate, failure to assess and monitor appropriately, failure to report significant findings, failure to act as a patient advocate and failure to document in details results of interactions with patients.

Accordingly, for practitioners to avoid litigation on PU , it is strongly suggested that documentation must be comprehensive, consistent, concise, chronological, continuing and also reasonably complete and balanced with patient care (Baranosky, 2010). This implies that while the practitioners need to give attention to detailed documentation, the care provided to the client should not be compromised. For example, in the course of caring for a patient with a PU , events such as taking time to explain to the patient and the family how the pressure on the heel should be offloaded , regular turning of the patient or daily skin assessments are not always entered into the chart. However , the need for detailed documentation of every event has been criticized and labeled as ' an unreachably high standard,' with a possibility of compromising patient care if clinicians become more focused on creating perfect charts than caring for patients (Ayello et.al 2009).

In view of the emphasis placed on documentation, and in order to strike a balance between accurate documentation and quality patient care, some facilities in the US state that they practice "charting by exception," which implies recording only those events which deviate from the norm rather than documenting all standards of care. Clinicians are therefore warned to recognize and bear in mind that the charts they are handling today may be studied in the future in the court of law, and that legal decisions have often been based on what is not in the chart (Ayello et. al 2009).

An attorney; Kevin W. Yankowsky of Fulbright & Jaworksi, LLP, in Houston, Texas explained that most medical lawsuits begins with a search for answers, therefore healthcare practitioners are urged to be open and honest with patients and their families. For example, before pressure ulcers develop, family members of critically ill or terminal patients must understand the end-of-life process and the likelihood that skin breakdown may be part of the dying process. The Skin Changes at the End of Life (SCALE) document (Sibbald, Krasner , Lutz , et al. 2008) provides a description of skin at end of life. This documents was developed by an expert panel which agreed that, like any other organ of the body, the skin is subject to a loss of integrity at the end of life. These natural processes must be explained to patients and families to avert any litigation in an event of PU development in such cases.

In addition to the cost implications of PU lawsuits, Medicare noted that a PU-related lawsuit can cause severe damage to a facility's reputation in terms of quality patient care, as well as contributing to devastating staff morale, which may eventually turn clients away from

that particular facility. With reference to the released white paper, a Professor of Medicine, University of Texas Health Science Centre (Prof. Caroline Fife), observed that the interrelationship between medical decision-making, reimbursement and legal issues relating to pressure ulcers has never been greater , with a more treacherous medical-legal landscape. This suggest that the white paper which lays emphasis on clinical documentation proffers a legally sound advice to practitioners. Documentation needs to be chronological, concise continuing and complete. Documentation should focus on the following issues:

- Evidence of regular skin assessment
- Evidence of regular risk assessment for PU
- Evidence of PU assessment
- Documentation of wound measurement, treatment, PU redistribution devices, and turning interventions.

These points to the fact that all hands must be on deck to identify risk factors for PU and institute appropriate interventions. The Medicare also issued a no reimbursement policy for facilities when avoidable PU occurs.

2.17. Clinical Judgment and Clinical Decision Making

The health care system is dynamic and nurses have the responsibility to adapt to the changing technological landscape in healthcare. This calls for intellectual and cognitive skills for clinical decision making and judgment. Important clinical decisions occur on daily basis, with significant impact on clients' healthcare and outcomes in response to nursing care needs. It suggests that nurses who exercise good clinical decision skills can significantly improve the quality of patient experience, in this case, PU prevention and tissue viability issues.

Clinical decision involves the individual nurses' ability to sift, synthesize information, and make decisions in the midst of alternatives in a clinical environment. It is a complex process whereby the nurse practitioners determine the type of information to collect, through asking leading and relevant questions during history taking, in order to recognize problems based on identified cues. This essentially culminates into a decision on appropriate interventions. (Tanner, Padrick, Westfall & Putzier, 1989 in O'Reilly, 2009). In other words, it is the process of information gathering, processing and prioritizing critical patient cues with critical thinking ability to make appropriate decisions in patient care.

Benner and Tanner cited in Agbedia, Ofi and Ibeagha (2008) described clinical judgment as a thought used to recognize, understand, and label nursing diagnoses and subsequent action. This maybe influenced by personal factors such as years of experience in clinical practice. There is therefore an assumption that the more experienced nurses make better clinical judgments in practice. However, there are conflicting evidences in literature with regards to this. According to Banning (2008), although experience maybe a factor for consideration, nurses utilize two major models of decision making in practice, and these are Information processing model and Intuitive-humanistic model.

Information processing model of clinical decision making is described as involving four stages of scientific hypothetico-deductive process. It is also referred to as Bayesian logic. The processes involved are:

i. Cue recognition which involves gathering of preliminary medical information about the patient (cue acquisition stage)
ii. Hypothesis generation (short-term memory)
iii. Cue interpretation , whether the cues support or reject the hypotheses
iv. Hypotheses evaluation and clinician's decision.

Within this model (the Bayesian logic or hypothetico-deductive), the nurse practitioner makes use of decision modeling tool (decision tree) to mentally calculate the probabilities and select the most suitable alternative, using the most supporting evidences (Tanner et al., 1987 in Ward, 2008). This model is task-based and systematic in approach and is also regarded as the model of choice in medical decision making.

The Intuitive humanistic model on the other hand is described as the use of intuition, a 'gut-instinct' combined with subjective data and objective variables such as nurses' experience and client information. Benner and Tanner (1987) described intuitive reasoning as '*understanding without rational'*, a perception of possibilities, meanings and relationships by way of insight. According to Benner (1984), intuition is rooted in the ability to recognize patterns of cues, which is an ability that develops with experience in managing patients in nursing. This implies utilizing what is known in a previous situation to determine an appropriate course of action for a given new situation. Some authorities have dismissed the intuitive humanistic model as being unscientific, based on hunches or gut feeling and following the heuristic 'rules of the thumb'. Those who support the intuitive humanistic model of decision

making contend that experienced practitioners see patterns in whole situations and do not reduce situations into concrete parts for analysis, as occurs in analytical decision making process . The proponents explained further that the process of analysis of concrete parts may result in loss of sensitivity and the basis for decision making may be lost. This suggests that intuitive judgment distinguishes the expert from the novice; where the expert no longer rely on analytical principles to connect their understanding of the situation to appropriate action (Bjork & Hamilton 2011). Preventing PU in patients requires application of decision making models. The expert practitioner whose method of decision according to Benner (1984) is often based on intuitive humanistic model, reflects on past experiences with confidence to act on cues and hunches in implementing interventions or to seek advice from other healthcare professionals. For example identifying the risk for PU and ordering an appropriate cushion to distribute the patients' weight away from the bony prominences requires decision making for the type of cushion to use.

A qualitative study of Iranian nurses on factors which facilitate and inhibit effective clinical decision noted that competence and self-confidence were key personal factors that influence clinical decision making (Hagbaghery, Salsali, Ahmad, 2003). Competence, according to the authors, denotes a good level of professional knowledge and experience and ability to utilize same in clinical practice. Another emerging theme in that study was the significance of educational preparation in effective clinical decision making. The relationship of knowledge with effective clinical decision making has been explored in literature with Baker, (2000); Hagbaghery et al.,(2004); and Ayello, Zulkowski & Capezuti,(2010), noting that appropriate integration of knowledge, clinical skills and experience facilitates clinical decision making. In relation to PU prevention, Ayello et al (2010) explained that the persistent inadequate content of PU prevention in undergraduate nursing programmes bring to question the preparedness of newly qualified nurses for clinical decision making in pressure ulcer prevention. This suggests that lack of adequate knowledge in PU prevention results in the tendency to cling to ritualistic practices.

Pressure ulcer assessment tools assists the nurse in identifying deterioration of skin and the patients' risks of developing pressure damage and support the nurse in making clinical decisions about prevention and management. The assessment process, identification of risk factors and the treatment choices during the early stages of pressure damage can halt the process of tissue breakdown, and prevent progression to a more severe damage. In the nursing process

for PU prevention, risk assessment is the first step, and the information generated from during this phase assists in formulating a plan of care. The initial assessment also provides a base line from which to reassess and measure changes in the patient's condition and inform clinical decision making. It can be deduced from the foregoing discourse that clinical decision making is a process that allows the nurse to make judgments and build hypothesis based on past experience and knowledge of a condition, and the information gathered through assessment. As the nurse begins to see emerging cues during the encounter with the patient, his/her hypothesis may change depending on the available information, and the ability to act on past experiences. Thomas (1997) considers that practitioners can become expert decision makers and rapidly develop hypotheses based on past experience as they have a wide knowledge base. In this study, PU education would provide a knowledge base to facilitate decision making for PU prevention.

2.18. Concept of Critical Thinking

The rapidly changing health care environment in which nurses function makes critical thinking an important skill required for effective practice. This is because for nurses to provide effective care they must think critically while coping with the expansion of their roles which are associated with the complex health care environment. According to Simpson and Courtney (2002), if nurses are to deal effectively with complex changes, increased demands and greater accountability, they must become skilled in higher level thinking and reasoning abilities. Every day, nurses sift through an abundance of data and information to assimilate and adapt knowledge for problem clarification and solution. Several years ago, Colucciello (1997) opined that the use of critical thinking is vital in examining simple and complex situations in the nurses' day-to-day responsibilities; and that it is an essential means of establishing whether the information or assessment obtained has been accurately captured in order to articulate specifically and distinctly what the information conveys.

The American Philosophical Association (APA) in 1990 assembled a team of 46 experts within the US and Canada, representing disciplines in the humanities, sciences, social sciences and education and conducted a Delphi study. The APA Delphi Report stated that "Critical thinking is the process of purposeful, self-regulatory judgment, and a critical thinker is:

> The ideal critical thinker is habitually inquisitive, well informed, honest in facing personal biases, prudent in making judgment, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in selection of criteria, focused in enquiry and persistent in seeking results which are as precise as the subject and the circumstances if the injury permit.

Agbedia et.al (2008) observed that the profile of an ideal critical thinker as described by the Delphi panel is similar to Benner (1984) description of a nurse with expert clinical judgment skill, who possesses the ability to manage a range of information from diverse sources. Novices according to the theory 'from Novice to expert' (Benner 1984) may find it difficult to accurately define problems or choose the most appropriate solutions. This suggest that clinicians who are novices may experience difficulty in identifying and clustering relevant information easily, from which to formulate hypothesis for solutions compared to expert practitioners, who have mastered the art of logical thinking and synthesis of judgment to prioritize goals of care. Cooper (2013) explained that critical thinking skills enhance implementation of appropriate interventions for PU prevention among patients in the intensive care unit.

2.19. Competency in Nursing

Professional nursing practice is the incorporation of the art and science of caring which requires functioning at a level of competence. The words 'competence and competency' are not synonymous. Competence describes a potential ability or capability to function in a given situation while competency denotes an actual performance in a situation (McConnell, 1998). This implies that competence is needed to achieve competency. It occurs in a continuum, which when achieved must be sustained and maintained. The author explained further that competency enables one to fulfil work responsibilities; therefore, it is an important aspect of an organizational mission statement.

The concept of competency is a combination of attributes which enable performance of a range of professional tasks to meet the appropriate standards. It describes the ability of a nurse to practise safely and effectively, fulfilling his/her professional responsibility within his/her scope of practice (An Bord Altranais, 2005). This goes beyond achievement of psychomotor skills, but describes knowledge, skills, abilities and attitudes that underlie competent

performance. Thus, competency in nursing is a complex mix of attributes; knowledge, skills and attitude. Therefore competency in PU prevention encompasses knowledge , skills and attitudes. This suggests that while educational program is important to improve knowledge and skills for PU prevention, nurses need to cultivate positive attitudes in order to achieve the desired goal. In clinical decision making, it may be deduced that the knowledge which expert nurses possess, and the way it is organized is reflected in the accuracy of clinical decisions and the information which they use to make such decisions.

Benner (1984) based on Dreyfus and Dreyfus model, described five levels of skill acquisition in nursing thus: Novice, Advanced beginner, Competent, Proficient, and Expert. The stages are described below:

Stage 1: Novice: Beginners do not have experience and as such rely on taught rules which help them to perform in situations. Novices are taught objectifiable and measurable attributes such as weight, intake and output, temperature, etc. They also learn context-free rules that guide action in respect to these attributes. It is important to note that not only students are novices, but also any nurse entering a clinical situation where he/she does not have experience is said to be a novice. The novice practitioner will require more structured support when caring for patients at risk of pressure ulcer. Scott (2000), in relation to prevention of PU, maintained that the novice practitioner tends to focus on definitive cues as indicated by use of risk assessment scales.

Stage 2: Advanced Beginner: An advanced beginner, a step up from novice, can demonstrate marginally acceptable level of performance, one who has coped with enough real situations or pointed out by a mentor. The advanced beginner has adequate background experience to recognize aspects of a clinical situation.

Stage 3: Proficient: The proficient performer perceives situations in a holistic manner, rather than in parts, and performance is guided by maxims. The proficient performer recognizes situations in terms of overall picture and knows which aspect of the whole picture is more salient. He/she has an intuitive grasp of the situation based upon a deep background of understanding.

Stage 4: Competent: This stage is typified by conscious, deliberate planning. The plan indicates which attribute and aspects of the current and contemplated future situations are to be considered most important and which to be ignored. This stage is evidenced by increased level of efficiency.

Stage 5: Expert: The expert is a hybrid of practical and theoretical knowledge, and the stage is developed only when the clinician tests and refines theoretical and practical knowledge in actual clinical situations. Expertise develops through a process of comparing whole similar and dissimilar clinical situations with one another, thus an expert possesses a deep understanding of clinical situations based on many past paradigm cases.

Clinical decision making is thought to improve with experience within a specific specialty (Banning, 2008). It is believed that at least 10 years is required to gain the experience necessary to become an expert in a particular area of practice (Benner 1984) and the nature of expert knowledge is specific. This suggest that if experts are asked to perform outside their areas of expertise, there will be no baseline experience to fall back on, therefore the expert will operate at the level of a novice. For PU prevention, it may be inferred that the more experienced nurses in clinical practice will likely make better clinical decisions than novices (below 10years); and therefore the levels of competency of nurses in implementing preventive protocol for PU determines the outcome. It is also important to note that experience without adequate knowledge does not enhance clinical decision making. Brookfield and Sherperd (1990) examined the association of the skills and abilities for clinical decision making and critical thinking among nurses in four types of nursing programmes: baccalaureate, associate, diploma and post basic baccalaureate programmes. The study concluded that there was a significant positive correlation between effective clinical decision and critical thinking dispositions across levels of education.

Maintaining skin integrity is a fundamental nursing concern, and it is imperative that nurses at all levels of care be proficient if not expert performers in prevention of skin breakdown. The key issues in the preventive plan include pressure relief, maintenance of clean intact skin, monitoring nutritional status, patient movement, and client and family education. All these interventions call for competence and clinical decision making. For example, devices for pressure relief come in the form of specialty beds, mattress replacement, overlays or assistive devices. The choice and decision with respect to an appropriate support surface that will provide adequate pressure relief, based on the individuals' level of risk, is pertinent in prevention. Turning and positioning schedule is an important consideration, as well as heel floatation, either with an assistive device or some pillows as part of the plan. Sometimes, the nurse may need consultation with the physical therapist as a resource for positioning. This, in conjunction with

appropriate client and family education, reduces break in tissue integrity. Competence in daily skin inspection to recognize color changes and documentation requires experience and sound knowledge base. The skin over bony prominences are examined during the process of changing positions and cleaning. Incontinent areas may require application of barrier ointment for protection. The patients' nutritional status is a key risk factor in pressure ulcer development; therefore, monitoring of the patient's nutritional status based on knowledge and adequate consultation with dietician for guidance and recommendations are pertinent decisions.

Considering levels of competence (Benner, 1984) at some level (novice, advanced beginner) when situations are novel, without previous experience, a methodical assessment is used because the practitioner is faced with an unfamiliar situation. This situation requires a purely analytical or rational assessment/decision strategies. The expert on the other hand with a deep understanding of the situation which is based on experience applies intuitive strategies for decision making.

2.20 Concept of Tissue Viability

Tissue viability is a concept which forms an essential consideration for effective management of all wound types. It describes the maintenance of skin integrity, as well as the management of patients with acute and chronic wounds, including the prevention and management of pressure damage (Hertfordshire Community, 2010).

A viable tissue is described as bright red (granulating) or pink (epithializing), and this represents a conducive environment for wound healing. Conversely, non-viable tissue maybe black (necrotic) or yellow (sloughy) and if left in the wound promotes an ideal environment for infection and bacterial growth.

Tissue viability as a specialty practice of nursing ; one in which the specialist nurse practitioner with extensive knowledge and expertise provide valuable services across the health care continuum. They provide clinical support and take referrals from all units of the hospital. The Society of Tissue Viability Nurses (STVN) was formed in 1981 with the mandate of disseminating information, promoting research and increasing awareness of all good clinical practice in wound prevention and management, and essentially to provide expertise in wound management.

2.21. Theoretical Framework .

The use of theoretical models in a research study provide strong support to the work and further explain the phenomena of interest. Some theories and concepts which are considered necessary to explain the basic concepts in this study include Principles of adult learning and Rogers innovation –Diffusion theory. The conceptual framework for this study is based on these theories.

2. 22. Principles of Adult Learning (Knowles, 1990)

The principles of adult learning also known as andragogy represent a set of assumptions about how adults learn. Its root can be traced to Alexander Kapp, a German grammar teacher, who used it to describe Plato's educational theory (Knowles, Holton, & Swanson, 1998). It appeared again in 1921 when another German, social scientist, Eugen Rosenstock, claimed that "adult education required special teachers, special methods, and a special philosophy" (Knowles, Holton, and Swanson 1998). There is evidence that discussion of andragogy continued in Europe until Dusan Savicevic, a Yugoslavian adult educator, first discussed the concept in the United States. Malcolm Knowles heard about the term and in 1968 used it in an article ' *Adult Leadership*' From that point on, Knowles became known as the principal expert on andragogy. However, numerous adult educators including Brookfield (1986), Mezirow (1991), Lawler (1991) and Merriam (1999) have also addressed the concept and/or discussed how it can be used to facilitate adult learning. Basically using the concept, an adult learner has the following characteristics:

1. Autonomy and self-direction
2. Possess a wide experience and knowledge which include work and family and previous education. These past experiences are brought to the fore in a learning situation. Adults need to connect leaning with these experiences.
3. Adults are goal-oriented, and therefore, the objectives of learning must be clearly spelt out. They need to understand goals to be achieved at the end of the learning exercise.
4. Adults are relevancy-oriented. The relevance of the learning exercise must be explained. The usefulness of the learning to their work or life must be clear.
5. Adults are practical and tend to focus more on the aspects of learning which apply to their work.

6. Adults need to be accorded respect in the learning experience.

In relation to this study on effect of educational intervention on nurse's knowledge of PU prevention, nurses are adult learners at various levels of educational and professional experience. Some of whom might have listened to a lecture on PU prevention previously. This information was elicited using the structured questionnaire. The adult learning principles (Knowles, 1990) stipulate that learners need to know why the need to learn and that an adult learns better when learning experience is task-oriented, focused and related to his or her work. This study as an educational programme provided an interactive sessions, brochures and hand-on sessions of specific bedside activities to facilitate knowledge and practice. A pretest assessment provided an opportunity to identify gaps in knowledge that required to be filled. The researcher built on the participants' previous experience on PU prevention.

2.23. Diffusion of Innovation Theory (DOI) (Rogers, 2003)

Diffusion research was originally described by a French sociologist Gabriel Tarde in 1906, when he drew a S-shaped diffusion curve. Further work on this was done by EM Rogers in 1995. Accordingly, Rogers (2003) explained that most innovations or ideas have an S-shape mode of adoption through a culture. He postulated a theory which explains diffusion as the process by which an innovation or a new idea, practice or behaviour is adopted by members of a community. In studying how innovation or ideas can be adopted, Rogers (2003) argued that it depends on four factors:

1. The nature or characteristic of the innovation itself, which describes (a) relative advantage (b) compatibility (c) complexity (d) trial-ability (e) observability. According to the author relative *advantage* is the degree to which an innovation is perceived as better than the idea it supersedes, such as effectiveness. *Compatibility* is the degree to which an innovation is perceived as being consistent with the existing values, norms, work, and needs of the users (Rogers, 2003). The *complexity* of the innovation is the relative simplicity of the innovation; for example, an evidence-based practice such as tilting the patient to 30^0 side lying position, floating the heel to prevent PU is simpler than a more complex practice such as management of ulcer. The *trial-ability* of an intervention refers to the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003). *Observability* refers to the degree to which results of the innovation are

visible to others (Rogers, 2003). Innovations perceived as having greater relative advantage, compatibility with work and needs of users, less complex, and that can be trialed and observed are adopted more rapidly than other innovations.

2. The diffusion which describes the communication channels used to spread information about the innovation. Several methods have been employed such as educational outreach (Greenhalgh, Robert, Macfarlane, Bates, & Kyriakidou, 2005), opinion leaders and feedback (Hysong, Best, & Pugh, 2006; Titler & Everett, 2001), change champions (Rogers, 2003). Opinion leaders are effective in changing behaviours of health care professionals (Titler, 2008).This is because of the key characteristic of trust from others within the group.
3. Users: The users of the innovation within the social system influence the rate of diffusion of innovation. For example, the specific characteristics of nurses such as educational preparation and practice specialty may influence the rate of adoption.
4. The nature of the society to which it is introduced. This includes the leadership support, organizational resources, standards and policies/procedures. Rogers explained that the nature of the network and the role which opinion leaders play in them determine the likelihood that the idea or innovation will be adopted through the social system. He noted that opinion leaders exert a significant influence on the behavior of the audience or group via their personal contact, and that additional intermediaries called change agents and gatekeepers are significant in the process of diffusion.

The author described four distinct theories which are important in the diffusion process:

- The innovation-decision process theory
- The individual innovativeness theory
- The rate of adoption theory and
- The theory of perceived attribute.

Innovation–decision process theory: This is based on five distinct stages, and the first is knowledge. Potential adopters must first learn about the innovation. Secondly, they must be persuaded as to the merits of the innovation, and then they decide to adopt it. Adoption is then followed by implementation. Finally, they must confirm that their decision to adopt was appropriate .

Individual innovativeness theory: Rogers (2003) described five categories of adopters. The first category are the innovators, whom he termed as risk-takers who lead the way. The second group comprises the early adopters who help spread the word about the innovation to others. The third and the fourth groups are the early majority and late majority respectively, who are convinced by the innovators and the early adopters. However, the late majority wait to make sure that the adoption is in their best interest. The final group according to Rogers comprises the laggards who are highly skeptical and resist adopting until absolutely necessary. In many cases, the laggards never adopt the innovation.

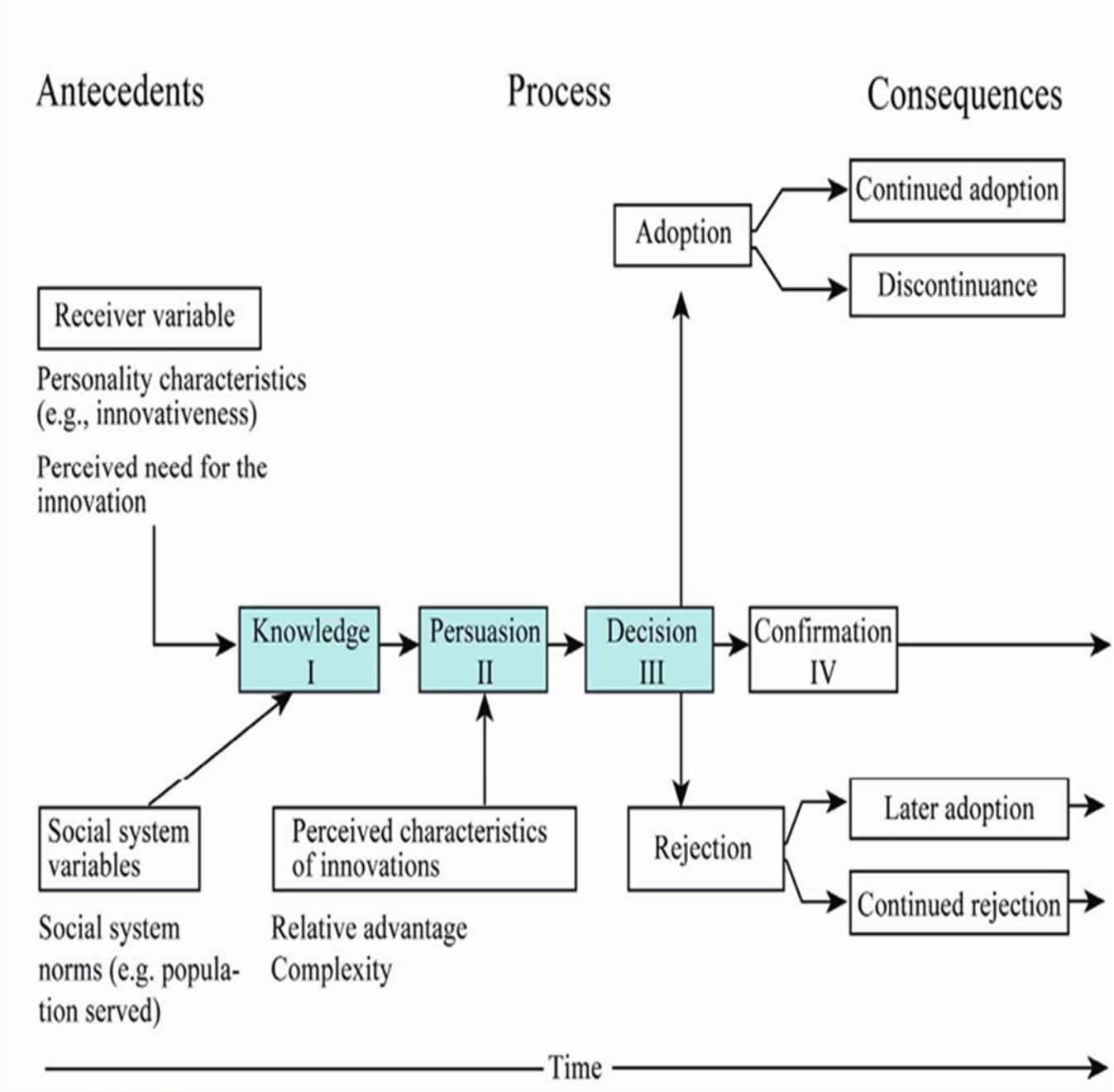
Theory of rate of adoption: The theory suggests that the adoption of innovation is best represented by an S-curve on a graph. It explains that adoption of an innovation grows slowly and gradually in the beginning, with a period of rapid growth that tapers off and becomes stable and eventually declines .

Theory of perceived attribute: Rogers explained that individuals will adopt an innovation if they perceive that it has the following attributes:

1. Some relative advantage over an existing practice
2. Compatible with existing values and practices;
3. Not too complex;
4. Possess trialability: it can be tested for a limited time
5. Offer observable results.

In summary, the scope of diffusion research therefore focused on five elements: the characteristics of an innovation, such a new guideline on PU prevention may influence its adoption; the decision-making process that occurs when an individual considers adopting a new idea or practice; the characteristics of individuals that make them likely to adopt a practice; the consequences for individuals and society of adopting a practice; and finally, the communication channels used in the adoption process.

figure 2.5



Stages of Innovation-decision process

Source: Rogers (2003): Diffusion of Innovation, 4th ed. New York

2. 24. Application of Theories to Study.

The tenets of diffusion of innovation theory helps to explain the steps required for a new practice to be adopted in a community. The author described an innovation as any idea, practice or object which is considered new to an individual. A practice guideline for PU prevention may be considered a new idea by the potential adopters, since there is none available currently in the settings for this study. Innovation-diffusion framework can be used to explain, predict and account for factors that increase or impede the diffusion of innovation. It identifies qualities of innovation (relative advantage, compatibility with values and needs) that will make an innovation appealing to potential adopters. It noted that the first step in the decision to adopt an innovation is knowledge, which the potential adopters must possess. This is the focus of the study.

The potential adopters of innovation in this study are nurses, whose knowledge of PU prevention must be improved through exposure to educational programme. They need to be persuaded as to the merits of the innovation. This will be achieved by creating awareness on the prevalence of PU in the settings and the outcome of the educational programme using a post intervention measurement. Once the potential adopters have adequate knowledge and are persuaded of the advantage of the innovation according to innovation-decision theory, the decision to adopt and implement the new practice is considered. Therefore the diffusion of the innovation is determined by adopters' knowledge; advantage of innovation based on their judgment, which must be simple, compatible and better than existing practice. This theory lends credence to this work because the ultimate goal of the study is to achieve a change in practice, which will facilitate reduction in prevalence of PU.

To ensure acceptability of the guideline, the theory suggests that it must be compatible, simple and well defined and nurses must see the relative advantage of the guideline. In this study, relative advantage of having a PU prevention guideline was explained to participants, as against the norm of working without one. Again participants were educated on the need for nursing documentation record, which through the Heads of Nursing in each hospital; these new ideas were introduced into the facilities. The ideas was first implemented in three selected wards in each hospital to assess the acceptability and ease of use. Following educational intervention, practice was examined in the selected wards of the experimental hospitals, and a

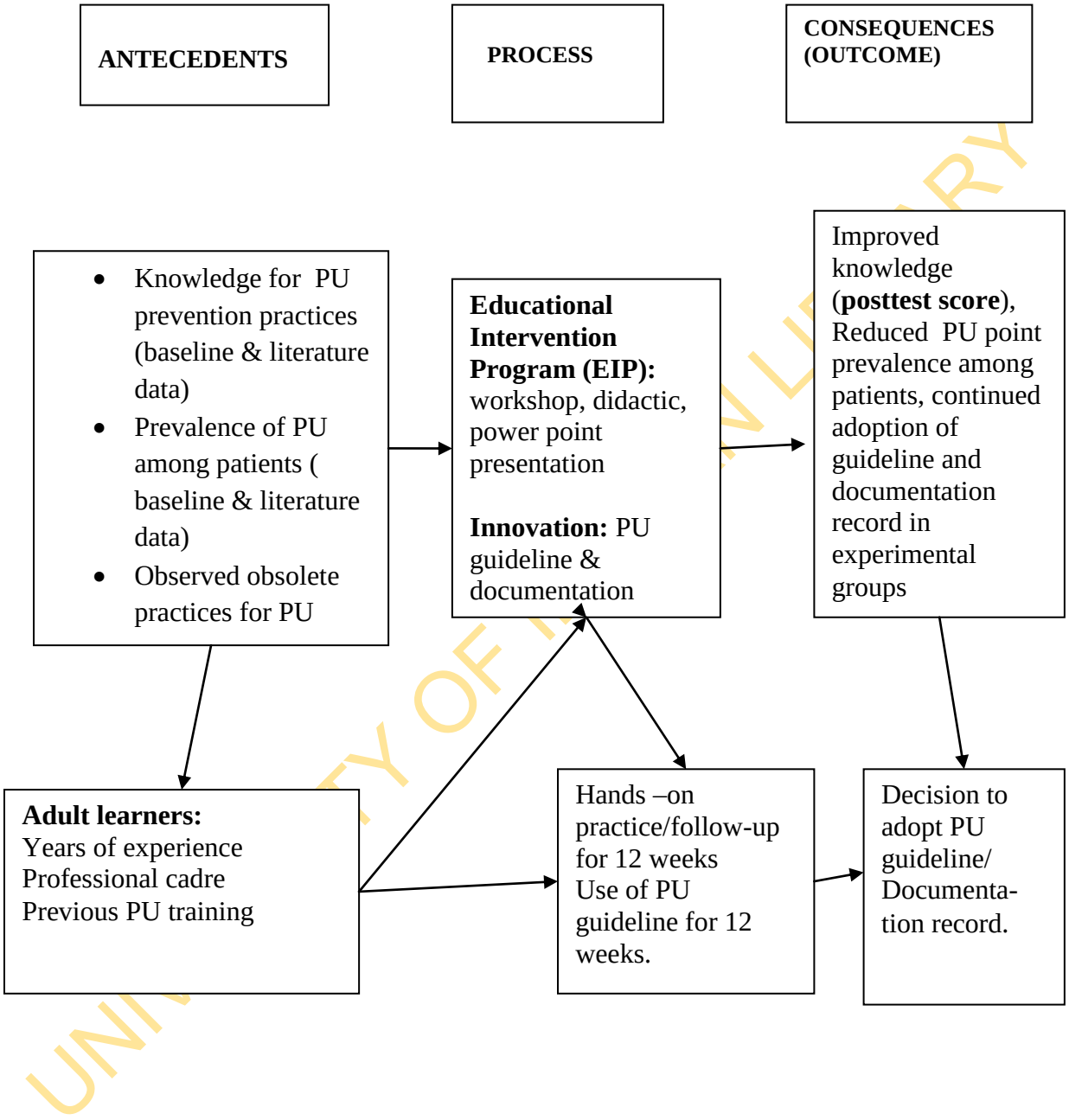
checklist was used for evaluation. A second point-prevalence study of PU was conducted on the selected wards where nurses were selected for programme. This was done after 12 weeks.

Implementation of new practice often requires organizational support towards provision of required resources like foam and mattress overlays, alternating mattresses and specialty beds including other consumables. For this reason, therefore, the researcher sought consultations and administrative buy-in to the programme in order to achieve the study objective of change in practice. The researcher provided the required consumables through the support of private organizations in wound care. It is hoped that this will be sustained with administrative support The diffusion of the new idea was achieved through the use of brochures and protocols. Nurses who participated in the training would , from that time be seen as site champions who will act as coaches or key opinion leaders, and facilitate the spread of the idea in each hospital.

In line with the principles of adult learning, nurse practitioners are adult learners who need to identify the need to learn and be sufficiently motivated to do so. Their experiences were taken cognizance of in the teaching and learning strategies which were interactive. Brochures with practical hands-on sessions were used to help them practise in a real life situation. According to Knowles, adults' readiness to learn is based on what they need to know to cope effectively in real-life situations. Nurses working in wards where patients at risk for pressure ulcers are commonly admitted were purposively selected for the educational programme. This was done to consider roles relevant to work and past experiences of the learner with regards to pressure ulcer prevention and management.

The first phase of the study surveyed the knowledge base of practising nurses on PU prevention, with the aim of identifying existing gaps to be filled with an educational programme. Furthermore, a point prevalence of PU among patients was conducted to provide a baseline data to measure the outcome of implementation of a new idea and also provide an objective measure of the intervention. This evaluation was followed by an educational intervention, which is aimed at introducing a protocol for assessment and prevention of pressure ulcer. In view of these, nurses in the survey phase of the study were asked to indicate their willingness to attend the workshop.

Figure 2.6. Conceptual framework



An Integration of Diffusion of Innovation Theory and Adult Learning Principles in Pressure Ulcer Prevention Study. (Ilesanmi, 2012)

2.25. Hypotheses

The following hypotheses were tested:

1. There is no significant effect of educational intervention on nurses knowledge of PU preventive strategies between experimental and control groups.
2. There is no significant effect of selected demographic characteristics (years of experience, professional cadre, educational level, previous exposure to PU lecture) on posttest scores of nurses in experimental and control groups.
3. There is no significant interaction effect of treatment, professional cadre, previous exposure to PU lecture on posttest score in experimental and control groups.
4. There is no significant difference in the immediate posttest mean score and three months score of nurses in experimental and control groups.
5. There is no significant difference in nursing practice for PU prevention pre and post intervention between experimental and control groups.

CHAPTER THREE

3.0. METHODOLOGY

In this chapter the design of the study, setting, participants, sampling procedure, method of data collection and the methods employed for statistical analysis are explained. The study was conducted in two phases (I&II). Phase I was a survey of nurses' knowledge of pressure ulcer prevention in the three selected teaching hospitals. The most commonly used nursing interventions to prevent pressure ulcer were also assessed, as well as factors which hinder preventive interventions in the various hospitals. The second phase (II) was the quasi-experimental, pretest posttest study, which involved the exposure of the selected groups to an educational intervention programme.

3.1.1. Research Design

a.Phase I: Cross sectional survey which examined baseline knowledge of PU prevention among nurses in selected hospitals. The result of the survey provided baseline information as to what should be included in the educational intervention during phase two of the study. Secondly, it served as a screening procedure from where consented participants for the training were drawn.

b. Phase II: Quasi experimental pretest- post test design.

O_1	**X**	**O_2**	**Experimental Group**
O_1		**O_2**	**Control Group**

Key: **O_1: Pretest measurement**

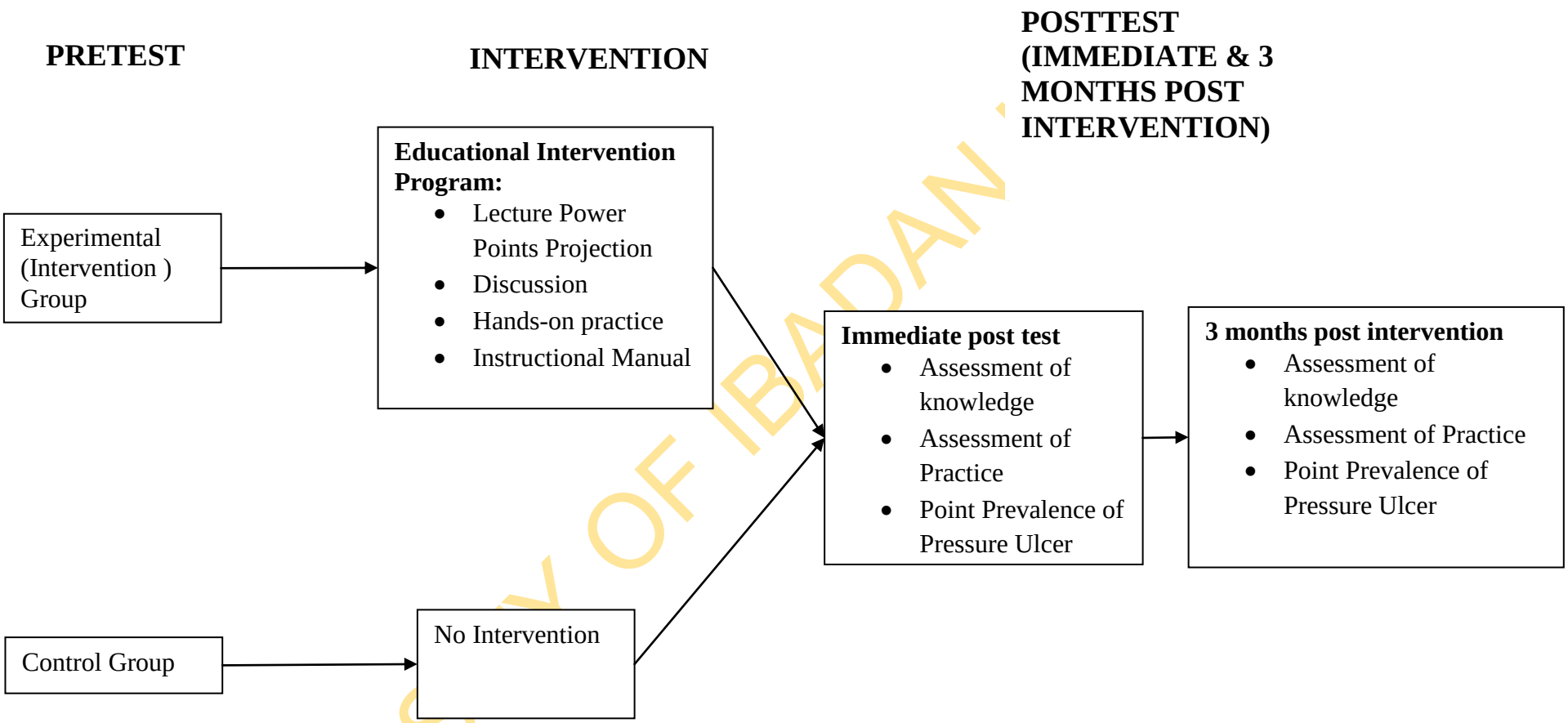
X: Treatment/Educational Intervention Program

O_2: Posttest Measurement

c. Point-prevalence Survey: A point-prevalence study to determine the effect of the programme on patient outcome. This was taken on patients in the selected wards of the

three hospitals, both experimental and control hospitals (UCH, LASUTH & OAUTHC), to provide a baseline data for the evaluation of the impact of the educational prevention programme. Each patient currently on the ward was examined for presence or absence of pressure ulcer.

Figure 3.1: DIAGRAM SHOWING THE DESIGN OF THE STUDY



3.1.2. Settings: The study was conducted in three selected University teaching hospitals in South West Nigeria: One state- owned and two federal teaching hospitals.

The south western geo-political zone consist six states: Oyo, Osun, Ogun, Lagos, Ondo and Ekiti states. There are six University teaching hospitals within the zone. Two are located in Lagos and Osun states, Oyo and Ogun states had one each, while Ekiti and ondo had none. University Teaching hospitals were chosen for the study because these institutions are primarily meant for teaching, research and services. Moreover these are referral centers for primary and secondary levels of care; therefore patients with conditions requiring long hospital stay are referred to these hospitals, some of whom may be predisposed to development of PU.

The teaching hospitals in South-West geopolitical zone are**:**

Table 3.1. Teaching Hospitals In South West Nigeria (As at 2009)

Teaching Hospitals	States of Location
• University College Hospital(UCH). Ibadan	Oyo State (Federal)
• Lagos State University Teaching Hospital (LASUTH)	Lagos State (State-owned)
• University of Lagos Teaching hospital. (LUTH)	Lagos State (Federal)
• Obafemi Awolowo Teaching Hospital Complex (OAUTHC), Ile-Ife	Osun State (Federal)
• Ladoke Akintola University Teaching Hospital (LAUTHC), Osogbo	Osun State (State –owned)
• Olabisi Onabanjo University teaching Hospital (OOUTH), Sagamu.	Ogun State (State-owned)

3.1.3. Sampling of Settings

The University teaching hospitals were purposively selected (2 federal and 1 state-owned institution). This was considering the fact that the federal University teaching hospitals tend to admit more patients with complex conditions, and the available facilities are more than what is obtained in the state University teaching hospital. Again the medical specialties/ units are better defined based on patient's specific problems.

The selected hospitals are:

- Lagos State University Teaching Hospital (LASUTH)
- University College Hospital(UCH) Ibadan
- Obafemi Awolowo Teaching Hospital Complex, Ile Ife.

3.1.4. Brief description of the settings:

Obafemi Awolowo Teaching Hospital Complex (OAUTHC) Ile-Ife.

The OUATHC formerly known as Ife University Teaching Hospital is one of the nation's first generation teaching hospitals established on 8th May, 1972 by the Federal Government to provide qualitative health care delivery. The name was changed in 1987 in honour of the late distinguished Elder Statesman, Chief Obafemi Awolowo.

The Ile-Ife hospital unit provides tertiary services. It consists of 362 in-patient beds, excluding accident and emergency, recovery room and children emergency services. The hospital provides clinical services in nephrology, pediatrics neurology, cardiac, orthopeadics, etc. In the medical-surgical units of the hospital , there are 138 nurses distributed to 9 wards. In each ward, not more than 18 nurses run three shifts on a 26-bedded ward (2 nurses per shift) Therefore on the average , the ratio of nurse to patient on any shift is 1 nurse to 13 patients, with slight variations during the morning shifts.

Nurse : Patient ratio : 1 nurse to 13 patients (1: 13)

University College Hospital, Ibadan

The University College Hospital Ibadan is the nation's premier teaching hospital that was established in 1957. The vision for its establishment includes being a stimulus for medical education in West Africa, a centre for clinical excellence and the bastion of scientific research in the medical sciences.

The hospital has 45 specialty and sub-specialty disciplines and runs 75 consultative clinics per week. The bed complement of the hospital is 805. There are 1040 nurses involved in direct patient care. Typically on a 36-bedded ward, there are between 22 and 25 nurses distributed into three shifts; (3 to 4 nurses per shift) Therefore, the average ratio of nurse-to-patient on any shift is one nurse to nine patients.

Nurse: Patient ratio: One nurse to Nine patients (1:9)

Lagos State University Teaching Hospital, (LASUTH), Lagos

The Lagos State University teaching hospital is a state-owned institution. It stands as a vanguard of a state-run health care system, consisting of 24 general hospitals and a large number of health centres. The hospital started with an initial focus on emergency services, which is still part of its mission statement and has now expanded to include a large number of specialty and sub-specialty services across the medical spectrum. The services include medical, burn and plastic, orthopedics, ophthalmology, cardiothoracic surgery. There are an average of 10 to 16 nurses on a 16 to 24-bedded ward. On morning shift, an average of three nurses are on duty, while on night shift usually 1 to 2 nurses. The nurse-patient ratio is therefore 1 to 12

Nurse : Patient ratio: 1 Nurse to 12 patients (1:12)

3.1.5. Participants: Participants were nurses in the three selected teaching hospitals in South West Nigeria: University College Hospital, Lagos State University Teaching Hospital and Obafemi Awolowo Teaching hospital, Complex Ile Ife.

3.1.6. The Inclusion Criteria: The inclusion criteria for this study included:

- Registered nurses who are working in surgery (orthopedics), medical and neurological wards, intensive care unit, including accident and emergency units.
- Those with not less than 6 months work experience on the identified wards.
- They must be involved in direct patient-care.
- Those who are willing to participate and also sign consent form.

3.1.7. Target Population: The study findings are generalizable to all nurses providing direct care and working in acute care settings, where the need to identify patients at risk for PU development and management is necessary.

3.1.8. Sampling Procedure: Sampling was done in stages, using a combination of cluster stratified proportional sampling. The researcher first of all sampled the hospitals and wards, followed by the nurses.

Hospital and Wards Sampling: The teaching hospitals were placed in two main clusters based on their proprietorship: State Government and Federal Government. There are three federal institutions and three state-owned institutions in the geo-political zone. A purposive sampling was done to choose the hospitals in the ratio of 1:2, thus 1 state-owned institution and two federal institutions. The selected institutions were:

University College Hospital, Ibadan (Federal)

Obafemi Awolowo Teaching Hospital Complex, Ile-Ife (Federal)

Lagos university Teaching Hospital, Lagos (State-Owned)

The wards were selected purposively based on where patients with long stay conditions are admitted. The nurses in accident and emergency (A&E) unit were included in the study because some patients spend long hours on the hard couches, while waiting to be transferred to the wards. Some of such patients develop PU before transfer. Nurses in theatre were also included in the survey because literature confirms that long hours on surgical couches also predispose patients to PU development.

Nurses Sampling: A census of the nurses based on their cadre/strata in the selected hospitals/wards was obtained. This was followed by a stratified proportional sampling method, using the duty roster as the sampling frame. The number was based on the size of the stratum, using the professional cadre of :

1. Staff nurse (RN)
2. Senior Nursing Sisters (SNO)
3. Principal Nursing Officers (PNO)
4. Assistant Chief Nursing Officers (ACNO)
5. Chief Nursing Officers (CNO).

To determine how large a sample to be taken from each stratum, a proportional stratified sampling was introduced to obtain sample from each stratum in proportion to the size of the stratum. The number of nurses by cadre on the different adult medical surgical units in each hospital is as presented on table 3.1.2

Table 3.1.2. Number of Nurses in the Selected 3 Hospitals by Unit and Cadre: June 2010.

	Neuroscience	Medicine	Surgery	Theatre	A/E	Total
UCH						
• ADN	7	3	2	Nil	3	**15**
• CNO	16	10	7	15	10	**58**
• PNO	15	7	8	14	8	**52**
• SNO	10	9	6	3	6	**34**
• NO1	46	29	26	29	7	**137**
• NO11	17	46	44	16	15	**138**
Sub total	**111**	**104**	**93**	**77**	**49**	**434.**
LASUTH						
• ADN	Nil	Nil	Nil	**Nil**	Nil	**Nil**
• CNO	3	13	13	6	9	**44**
• PNO	Nil	3	3	1	4	**11**
• SNO	Nil	Nil	2	1	1	**4**
• NO1	6	12	12	1	18	**49**
• NO11	4	11	25	Nil	18	**58**
Sub Total	**13**	**39**	**55**	**9**	**50**	**166**
OAUTHC.	3	8	5	13	2	**31**
• ADN	3	12	8	9	1	**33**
• CNO	1	4	1	6	Nil	**12**
• PNO	4	4	5	3	3	**19**
• SNO	5	8	15	5	3	**36**
• NO1	7	22	13	2	12	**56**
NO11						
Sub Total	**23**	**58**	**47**	**38**	**21**	**187.**

The total number of eligible nurses(3.1.2) in the selected units of the three hospitals is : Seven hundred and eighty-seven (787).

3.1.9 Sample Size Determination: This was calculated using the Cochrane (1997) formula for determining optimum sample size written as thus:

$$\frac{Z^2_{\alpha/2}\ P(1-P)}{d^2}$$

Where

α = Level of risk

Zα/2 = Upper % point of the standard normal distribution. Approx. 2.0

P = Prevalence rate = 50% .(0.5) (Panagiotopoulou & Kerr, 2002)

d = 0.0464 : Error committed by using the prevalence rate as being P = 0.50.

$$n = \frac{(1.96^2)\ (0.50)\ (0.50)}{(0.0464)^2} = 446.0$$

A total of 446 Nurses were therefore recruited proportionately for the study from the three hospitals.

Sample Size for Survey: Four hundred and forty-six nurses (446).

To obtain a representation sample, the total sample size required was divided in proportion to the number of eligible nurses in each of the three hospitals:

OAUTHC: Number of eligible nurses: 187. $\frac{187}{787} \times 446 = 106$

UCH: Number of eligible nurses: 434 $\frac{434}{787} \times 446 = 246$

LASUTH: Number of eligible nurses: 166. $\frac{166}{787} \times 446 = 94$

3.1.10. Instrument for Data Collection: The instrument used for data collection was a structured questionnaire adapted from the Pressure Ulcer knowledge Test (PUKT) developed

by Pieper and Mott (1995) which was also used by Calgary Health Region (Sinclair, 2004). Additional content for the instrument was drawn from published international practice guidelines for pressure ulcer prevention. The content was compared with updated literature on evidence – based practice protocols and standards. However, some items which were not applicable to the Nigerian settings were removed while some were reworded for clarity. The Questionnaire consisted of five sections:

Section A: Elicited information on participants' demographic data and continuing professional development with regards to pressure ulcers.

Section B: Consisted of 47 items, designed to measure nurses' knowledge of risk factors, preventive strategies and staging of pressure ulcer. Every correct response of 'Yes' and 'No' was scored 1. While incorrect response of 'No, Yes, or 'I Don't know' is scored 0. A total obtainable score on the test questions was 47 (100%).

The score was interpreted as follows

A score of less than or equal to 24; (below 50%): Low Knowledge

A score of 25-32; (51-69%): Moderate Knowledge

A score of 33-47; (70% and above): High Knowledge. (Pieper & Mott 1995)

Section C: Assessed the nursing interventions commonly used in the management of risk factors for pressure ulcer. It consisted of a 12 self- report items with 4 graded responses of *'Mostly Used' 'Occasionally Used', 'Not Used at all' and 'Don't Know.'*

Section D: Examined the factors which were judged by nurses as hindrances to preventive practices. This section of the questionnaire comprised 11 self-report items graded on a 5-point Likert scale: Strongly Agree (5), Agree (4), Undecided (3), Disagree (2) and Strongly Disagree (1). There was however no right or wrong answer.

Pilot Study

3.1.11. Content Validity of instrument: The content validity was achieved when generated items were presented to the two research supervisors. One was an expert in the field of wound care, with both scholarly and clinical experience in PU prevention. The second reviewer was a seasoned nurse researcher and lecturer. Both experts reviewed the test items for accuracy of content. The content of the instrument was also read several times to compare with the research questions and hypotheses. This was to ensure that the items on the instrument covered the relevant content of the study. The items were revised according to each reviewer's comments. A statistician was also consulted for suggestions in preparation for accurate data analysis.

3.1.12. Reliability of Instrument: Although the Pressure Ulcer Knowledge Test (PUKT) (Pieper &Mott, 1995) has accepted psychometric properties and had been used in several studies in other countries, the reliability of the instrument was conducted to assess the psychometric properties and ensure the adaptability of the instrument to the Nigerian setting. A split half reliability test was conducted. Each participant's performance was split into 2 halves: odd and even numbered-items . This was to determine how each respondent performed on the grouped odd numbered and even numbered items. Each respondent's total score on each half was computed and the two sets of scores were correlated. The Cronbach's alpha calculated for section A was 0.861, split-half reliability of 0.654 was also obtained, indicating that the items were internally consistent and demonstrated a strong relationship between the independent and dependent variables.

For sections B and C , the split-half reliability was 0.82 for this study respectively. The results of the reliability test were above the minimum acceptable standard of 0.6 (George & Mallery, 2003), therefore the instrument was considered reliable.

The pilot study was conducted using the adapted version of the instrument on one hundred and eleven (111) purposively selected nurses, from specific medical, surgical, accident and emergency and neurological wards in Olabisi Onabanjo Teaching Hospital, Sagamu. Ogun State. This is a state-owned teaching hospital, whose nurses possesses similar characteristics as those in the settings for the actual study.

3.1.13. Ethical Consideration

The study was conducted strictly on human subjects; and therefore, the researcher presented the proposal to the Department of Nursing which was approved. In addition, the researcher applied for approval to the institutional review boards of the various teaching hospitals. This was also granted. The standards and principles of bioethics were observed throughout the course of this study. The guidelines that were followed are as presented:

***Informed consent*:** The nature of the study was adequately explained to the participants. These included the purpose, the duration, the venue, the time and the logistics involved.

***Confidentiality*:** The participants were assured that their identities would not be disclosed as their names were not being required. Identification numbers were provided for participants.

Vulnerability: The study did not require any form of medication nor invasive procedures, therefore, the participants were not vulnerable to any hazard.

Cost-benefit ratio: The survey participants were informed that completing the questionnaire would cost 30 minutes of their time. Although the participants were not being paid fees for attending the workshop, lunch and support for transportation were provided.

Respect for Participants: The researcher showed courtesy and sought consent from the participants. They were neither coerced nor over induced to take part in the study.

Consequence of Participants' Decision to Withdraw from Research: Participants were informed of their right to withdraw from the study freely without victimization at any time they felt strongly so.

Voluntariness: Participants were informed that their participation in the study was entirely voluntary.

3.1. 14. Procedure for Data Collection: Phase I.

The researcher recruited and trained three (3) research assistants to facilitate data collection. A letter of introduction from the Department of Nursing, University of Ibadan was presented at the various settings explaining the aim of the study.

The researcher was introduced to the head of each ward/unit and each of them was briefed about the study. Nurses were approached individually during their break periods. The purpose of the study was explained to each participant and each of them consented. Those on afternoon shift were approached at a time before the change of shift, taking into consideration the

peculiarity of nursing schedule. The questionnaire was given only to consented nurses. The completion of the questionnaire took an average of 25 minutes. All the questionnaires were retrieved immediately after completion. This procedure was carried out in all the three selected hospitals and 100% response rate was achieved. The result of this phase (survey) provided a baseline for phase II.

3.1. 15. Statistical Analysis of Survey Data:

The data were coded using the Statistical Package for Social sciences (SPSS) version 17.0, for analysis of responses to the test items. Descriptive statistics was used for discrete data. Thus, the frequency, percentages, mean and standard deviation for discrete variables were used. Spearman correlation was used to test association between knowledge of PU prevention and educational level among survey subjects. P value was set at 5% level of significance.

3.2.0. Phase II of the Study

In the second phase of the study, participants were exposed to an educational intervention. The purpose of this phase was to assess the effect of an educational intervention on knowledge of preventive interventions for pressure ulcers among nurses. In addition, the educational programme was to acquaint the nurses with the current evidence-based interventions to prevent PU in hospitalized patients.

3.2.1. Design: This phase was a quasi-experimental pre- test posttest control group design.

3.2.2. Activities in Phase II were:

- Pre test for nurses in the selected wards of both intervention and control hospitals.
- Educational intervention for the nurses in selected wards in the experimental hospitals (UCH and LASUTH)
- Immediate post intervention test
- A point- prevalence of PU on the 3 selected wards in experimental and control groups was taken before and after intervention

- Monitoring of practice of intervention on patients in the selected wards for 3 months, using a check list
- Second post intervention questionnaire administered to nurses in the 9 wards (3 wards from each setting, including the control group)

After the educational intervention for the nurses, another point-prevalence of pressure ulcers among patients was conducted after 3 months in the selected wards. The aim was to evaluate the effectiveness of practice in preventing PU among hospitalized patients.

3.2.3. Participants: Participants in this phase of the study were selected from specific wards, some of whom did not take part in the survey, but fulfilled the inclusion criteria.

3.2.4. Sampling Procedure

1. Hospital selection as experimental and control group: A simple random sampling of balloting was done to place the settings in experimental and control groups thus: University College Hospital (**Experimental),** Lagos State University Teaching Hospital **(Experimental),** Obafemi Awolowo Teaching Hospital Complex **(Control Group)**.
2. Sampling of Wards: The wards were purposively selected based on where patients with conditions which highly predispose to pressure ulcer development were commonly admitted - Neuroscience, medicine and orthopedic surgery. Three wards were selected from each setting thus:
    i. **UCH:** North West 1(Neuroscience), South East 1(Orthopedic) and South West 3(Cardiac & Renal)
    ii. **LASUTH:** BT Ortho, male and female (Orthopedics) BT Cardio and Neuro (Male & female) , and Male Medical, A and B (Renal)
    iii. **OAU:** Male Surgical ward I &II (Renal), adult orthopedic ward (Male and Female), and Female medical ward I &II (Cardiac & Neuro).
3. **Sampling of Nurses:** A total sample of nurses in each selected ward cluster was taken. This is because of the small number in each ward and to facilitate achievement of study objectives. The number of nurses by the selected wards was as follows:
    - University College Hospital**:** North West I: 25 nurses, South West I: 23 nurses, South West III: 23 nurses. **Total: 71 Nurses**.

- Lagos State University Teaching Hospital**:** BT Ortho (Male &female): 19 nurses. BT Cardio and Neuro (Male &Female): 16 nurses, Medical (male &female): 21 nurses. **Total: 56 Nurses**.
- Obafemi Awolowo Teaching Hospital Complex, Ile-Ife: Male Surgical ward: 27 Nurses. Adult Orthopedics 16 Nurses, Female medical ward: 23 Nurses **Total: 66 Nurses.**

Total Sample Size for the Quasi-Experimental Phase: 193 Nurses, (both experimental and control groups).

3.2.5. Procedure for Data Collection: The researcher trained three (3) research assistants with a minimum of Bachelor degree in Nursing who assisted with distribution and collection of questionnaires, registration of participants, distribution of workshop materials and other logistics, while the researcher personally delivered the intervention package. This was to ensure adequate and reliable assistance to the researcher during data collection. The workshop was conducted in each experimental hospital (LASUTH and UCH), with the assistance of the nursing continuing education unit of the hospitals.

3.2.6. Conduct of the Workshop: The consented nurses from the two settings constituting the experimental group (UCH and LASUTH) were invited to attend the workshop which was organized in the respective hospitals. Because of the peculiarity of nursing schedule and the fact that all the nurses in the selected wards could not be withdrawn from the wards at the same time, the participants were taken in two batches for the workshop. However, with the support of the Director of Nursing in each setting, the participants in the experimental wards were drawn to take the pretest at the same time. This was to ensure the uniformity of their entry behaviour and baseline data. After the pretest, the participants were divided into two batches to attend the 5-day workshop. In each setting, the workshop was conducted twice. This strategy was to allow a complete attendance by the participants and to facilitate a uniform hands-on experience which is required for evaluation of practice at the end of the program. At the end of the workshop, participants were asked to complete a post test (Post 1) before leaving the session. They were also reminded that a third questionnaire will be given to them after 3 months.

Based on the workshop attendance register, the participants were contacted through phone calls, SMS messages and email for the final post test (Posttest II) at the end of 12 weeks. Moreover, due to the peculiarity of nursing work schedule, it was difficult to gather all the nurses together. Those who could not attend the second meeting were contacted individually to complete the Post test II. The completed questionnaires were retrieved on the spot.

3.2.7. Instrument for Data collection: The following instruments were used in phase II:

- The PUKT for pretest and post test;
- A risk-based prevention intervention checklist for assessment of change in nursing practice as operationally defined in the study;
- A nursing documentation record developed by the researcher to facilitate documentation of interventions provided during the study;
- An intervention package was developed and used as treatment.

3.2.8. Outcome Measures: Outcome was determined based on the achievement of measures described in the risk-based intervention checklist as follows:

- Risk assessment of client at least 6hrs after admission using the Braden scale;
- Evidence of completion of risk score;
- If assessment indicates presence of risk, evidence of receiving preventive interventions;
- Care plan for preventive interventions;
- Evidence of reassessment in response to changes in client's physical status;
- Evidence of acting on individual component of risk assessment;
- Documentation of skin inspection and action taken;
- Reduced incidence of pressure ulcer using a point-prevalence study.

3.2.9. Procedure for Conduct of the Workshop

Introduction to the workshop: PU prevention is a quality improvement and patient safety initiative which is central to nursing. PU increases patient suffering and pain as well as direct cost of management and hospital stay. A focused educational programme is documented to be an effective strategy to improve nurses' knowledge of PU

prevention. A positive change in practice maybe influenced by an organizational culture which supports PU prevention initiative.

Background: Inconsistency in practices on PU prevention is principally associated with absence of practice guidelines. Several indicators point to inadequate focused education on current recommended practices, which therefore leaves the nurses utilizing interventions which may be considered obsolete in most instances. Clinical observations of lack of practice guidelines, nursing documentation record for PU risk assessment and re-assessment makes this training very necessary.

Problem: Pressure ulcer constitutes a healthcare challenge to patients, families and the healthcare system. It causes pain, disfigurement and suffering, slow recovery from comorbid conditions, interfere with activities of daily living, and are strongly associated with longer hospital stays and mortality.

Need for training: The goal of the educational programme is to achieve an improvement in PU prevention strategies implemented by nurses in the selected facilities, through sharing best available scientific knowledge in this area of practice.

3.2.10. Protocol

Day One

Session I: The participants were given the programme of events for each day. They were encouraged to choose an identification number. A daily register was opened where all the participants registered and signed. The pretest (Questionnaire) was conducted, and explanation of the basis of the pretest was given to participants.

Session II: Module I was presented using a projector and PowerPoint. The focus of Module one was on:

- Anatomy and physiology of the skin
- Risk factors for PU
- Pathophysiology of PU
- Areas at risk for PU development
- PU staging.

Core Lessons learnt : A personal goal statement at the beginning of training is necessary.

Day Two

Session I**:** Daily logistics and a recast of the previous day's activities

Session II: Presentation of Module II, which focused on risk assessment. Specific content were:

- Braden Scale for measurement of risk level in patients
- Assessment of skin integrity
- Assessment of immobility level
- Assessment of risk for friction and shearing forces
- Assessment of risk for exposure to moisture and incontinence
- Assessment of nutritional status.

Core Lessons Learnt: An obvious gap in knowledge of risk assessment. This was brought to the fore by questions raised by the participants. Here is a need for programs on regular update and continuing education.

Day Three

Session I: Daily logistics, recast of previous day's activity

Session II : Presentation of Module Three focusing on the specific Preventive interventions such as :

- Positioning standards
- Interventions to minimize shear
- Interventions to minimize friction
- Different types of support surfaces
- Basic intervention for skincare
- Strategies to improve nutritional deficiencies.

Lessons Learnt: A strong need to collaborate with senior nursing team to facilitate implementation of interventions in the hospitals.

Day Four

Session I: Daily logistics and recast of previous day's activities

Session II: Presentation of Module four which focused on patient and family education for PU prevention

- Importance of family-centred approach to care
- Role of patient education in PU prevention.

- Application of Nursing practice models and theories to enhance family and patient teaching: Roy's Adaptation Model , Orem's Self Care Deficit theory.

Lessons learnt: A nursing model facilitates achievement of goals.

Day Five:

Session I: Daily logistics, recast of previous day's activities

Session II: Presentation of Module five which focused on:

- Nursing documentation using the document developed by the researcher. Participants were taken through how to document assessment findings for PU risk and interventions.
- Immediate post test questionnaire was distributed and retrieved.
- Post Intervention Assessment: Each participant was given an evaluation form to make a self-report assessment of the workshop. Forms were retrieved immediately after completion.
- Distribution of pamphlet/guideline, a summary of interventions for PU prevention developed by the researcher based on literature.
- A visit to selected wards for hands-on demonstration of repositioning standards, proper placement of static support surfaces and documentation.

3.2.11. Procedure for assessment of Practice: Follow-up Visits:

To achieve the goal of the intervention, the researcher visited the selected experimental wards where participants were drawn for the workshop. This was done at 2 weekly intervals to monitor practice, to achieve an ongoing assessment and to ensure performance improvement using a risk-based prevention intervention check-list. At such visits, specific staff education and reinforcement of standards was done as necessary.

At the end of the study, the control group was given the same educational package for ethical reasons.

3.2.12. Data Analysis:

Descriptive and inferential statistics using the Statistical Package for Social Sciences (SPSS), version 17.0 was used for data analysis. The mean and standard deviation of categories of

"mostly used' (4) and 'occasionally used' (3) , Not used (2) and Don't Know (1) interventions for PU prevention was done.

A paired sample t- test was used to compare the group means of knowledge score between the experimental and the control groups pre and post intervention. Analysis of variance (ANOVA) was used to determine the interaction effect of selected demographic characteristics on posttest knowledge scores in intervention and control groups. A paired sample t-test was used to compare the mean difference in point-prevalence of PU in intervention and control hospitals. Mann Whitney U and Wilcoxin Sign rank test was used to determine the difference in nursing practice pre and post intervention, in both experimental and control groups. The level of significance was set at $\alpha = 0.05$.

3.2.13. Outcome Measure: Practice

Outcome was determined based on the achievement of measures in the risk-based intervention checklist as follows:

- Risk assessment of client at least 6hrs after admission using the Braden scale;
- Evidence of completion of risk score;
- If assessment indicates presence of risk, evidence of receiving preventive interventions.
- Care plan for preventive interventions;
- Evidence of reassessment in response to changes in client's physical status;
- Evidence of acting on individual component of risk assessment;
- Documentation of skin inspection and action taken;
- Evidence of encouragement of independent movement; and
- Reduced incidence of pressure ulcer using a point-prevalence survey.

CHAPTER FOUR

RESULTS

In this chapter, the results of the study are presented based on the objectives of the study. The results of the survey aspect in the three hospitals are first presented, followed by the data on the quasi-experimental pretest posttest aspect of the study.

4.1.0. Result from Survey Study (Phase I)

Table 4.1.1 below shows the frequency of nurses who participated in the survey in the three hospitals

Table 4.1.1: Distribution of participants by study Site

Site	Frequency	Percentage
Lagos: LASUTH	94	21.1
Ibadan: UCH	246	55.2
Ife: OAUTHC	106	23.8
Total	**446**	**100.0**

Table 4.1.2: Gender Distribution of Respondents

Gender	Frequency	Percentage
Male	25	5.6
Female	421	94.4
Total	**446**	**100.0**

Table 4.1.2. shows the gender distribution of respondents in the survey. Only 25 (5.6%) are males while 421 (94.4%) are females.

Other Socio-demographic Characteristics of the Respondents in the Survey

Table 4.1.3. below describes other socio-demographic data of respondents. From the table, 168 (37.7%) respondents were within the age range of 31-40years. Those at their younger age (20-30yrs) constitute 23.1%.

Nurses who are diploma qualified (RN/RM) are 308, making up 69.1%. The RNs with a BSc constitute 13%, others within the educational category were RNs with degrees in Health Education. This group is made up of 76 (17%) nurses.

Panel D describes the professional category of respondents, indicating that 161 (36.1%) are Nursing officers, the Chief Nursing Officers are 80 (17.6%). The highest rank of nursing personnel in the study is the Assistant Director of Nursing (ADN). This group is composed of 8 (1.8%) nurses. Ten (10) respondents did not indicate their professional cadre.

The years of working experience of respondents is shown in table 4.1.4 below. From the table, 108 (24.1%) of the participants have worked for 1-5years, 116 (26%) worked for 6-10 years. Participants who have worked for periods over 31 years are 14 (3.1%). 77 (17%) have worked for 11-15 years.

Assessment of respondents' previous attendance of a workshop on PU risk assessment. This is shown in Figure 4.1.1 below and, indicates that 302 (67.7%) had never attended a training workshop on PU risk assessment while only 144 (32.3%) had the experience at different times.

Table 4. 1.3: Other Sociodemographic Characteristics of the Respondents in the Survey (N=446.)

S/N	Variable	Frequency	Percentage
A:	**Age**		
	20-30years	111	24.9
	31-40years	168	37.7
	41-50years	103	23.1
	51-60years	32	7.2
	No Response	32	7.2
B:	**Religion**		
	Christianity	393	88.1
	Islam	38	8.5
	Traditional religion	15	3.4
C:	**Educational Level**		
	RN/RM	308	69.1
	RNs with BNSc	61	13.7
	RNs with BSc Health Education	76.	17.0
	RNs with MSc	1	2.0
D:	**Professional Cadre**		
	Staff Nurse	78	17.5
	Nursing Officer	161	36.1
	Senior Nursing Officer	75	16.8
	Principal Nursing Officer	34	7.6
	Chief Nursing Officer	80	17.0
	Assistant Director of Nursing	8	1.8
	No response	10	2.2
E:	**Primary Unit of Practice**		
	Clinical Neuroscience	58	13.0
	Accident and Emergency	101	22.6
	Surgical In-patients	118	26.5
	Medical In-patients	96	21.5
	Critical Care Unit	73	16.4
	Total	**446**	**100.0**

Table 4.1.4: Years of Experience

Years of Experience	Frequency	Percentage
1-5 years	108	24.2
6-10 years	116	26.0
11-15 years	77	17.3
16-20 years	46	10.3
21-25 years	38	8.5
25-30 years	33	7.4
31 and above	14	3.1
No response	14	3.1
Total	**446**	**100.0**

Duration since Previous Attendance of a Workshop on PU Risk Assessment.

Among the respondents who had previously attended a workshop on PU risk assessment. 32 (22.2%) had that experience 1-11 months before the study. For 81 (56.3%) , this took place between 1 and 5 years while for 8 (5.6%) respondents, it was between 6 and 10 years prior to the study.

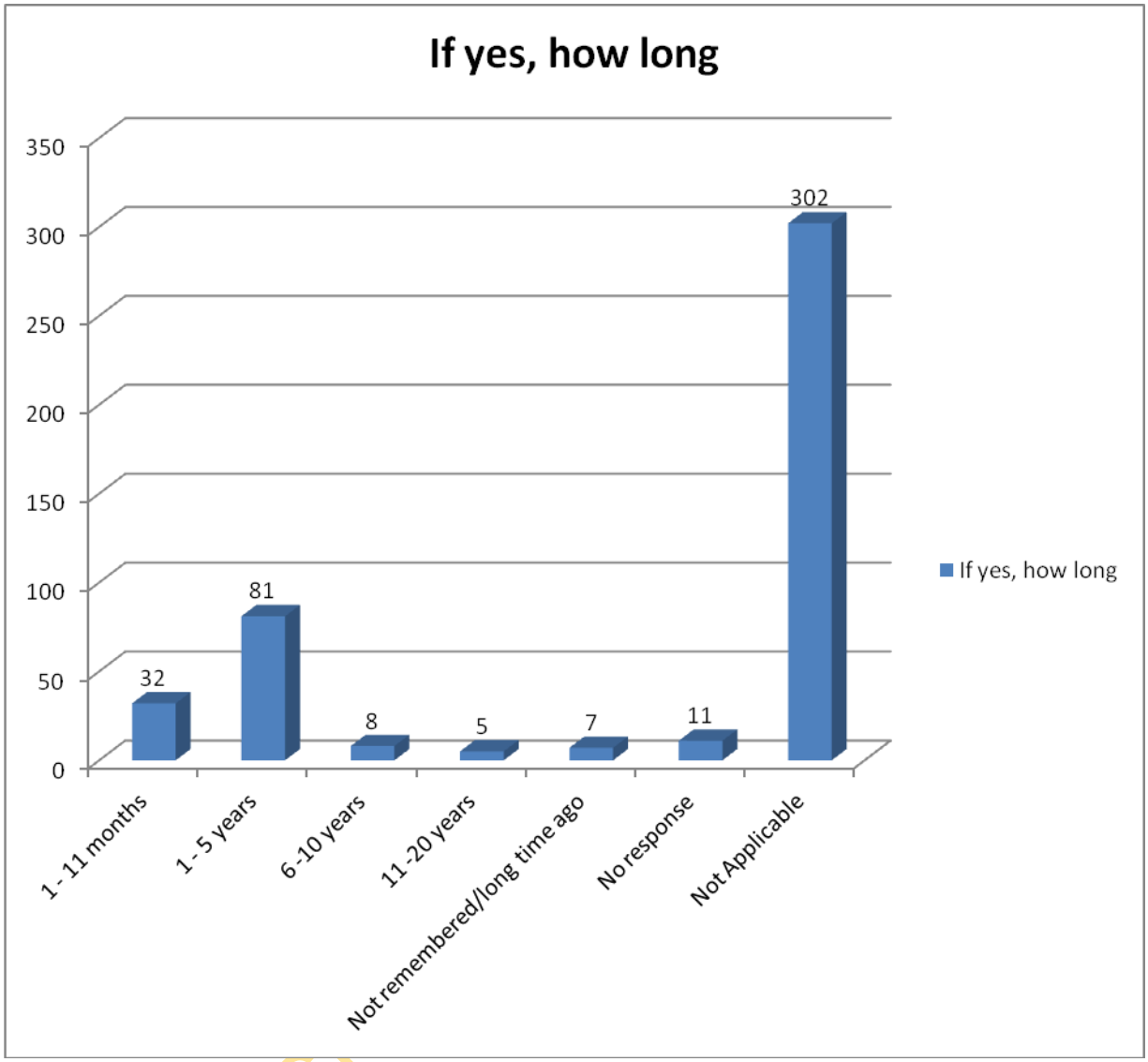


Figure 4.1 2. Duration of Previous Attendance in a PU prevention Workshop before the study.

Table 4.1.5. Current Interest on Educational Programme on PU Risk Assessment and Management

Interest on PU Prevention Education programme	Frequency	Percentages
Yes	431	96.6
No	15	3.4
Total	**446**	**100.0**

Table 4.1.5. indicates respondents who had interest in attending a workshop on assessment and management of risk for PU. From the table, 431(96.6%) nurses indicated interest in the programme while only 15(3.4%) did not indicate interest.

Respondents' Score on Pressure Ulcer Knowledge Test (PUKT): Items on Assessment

Table 4.1.6. Shows respondents' score on items on assessment of risk for PU. From the table, most assessment items were correctly marked by respondents. For example, 434 (67%) marked correctly the risk factors for PU (Item 1) (Mean=.97; SD=.17); 373 (83.6%) understood that all patients at risk for PU should have a systematic skin inspection at least once a week (Item 2). However, only 166 (37.2%) correctly defined blanching (Item 7), and 430 (96.4%) marked that a blister on the heel is nothing to worry about (item 11). On the interpretation of Braden score (Item 14), only 190 (42.2%) indicated correctly that a low Braden scale score is associated with higher risk for PU.

Table 4.1.6. Summary of Respondents' Score on Pressure Ulcer Knowledge Test (PUKT): Items on Assessment

N=446

Statement	Correct No	(%)	Incorrect No	(%)	Mean	Standard Deviation
1. Risk factors for development of pressure ulcers are immobility, incontinence, impaired nutrition, and altered level of consciousness.	434	67.3	12	2.7	.97	.167
2. All individuals at risk for pressure ulcers should have a systematic skin inspection at least once a week.	373	83.6	73	(16.4)	.84	.370
3. All individuals should be assessed on admission to a hospital for risk of pressure ulcer development	402	90.1	44	(9.9)	.90	.299
4. Slough is yellow or creamy necrotic tissue on a wound bed.	407	91.3	39	(8.7)	.91	.283
5. Eschar is good for wound healing.	255	57.2	191	(42.8)	.57	.495
6. Undermining is the destruction that occurs under the skin.	175	(39.2)	271	(60.8)	.39	.489
7. Blanching refers to whiteness when pressure is applied to a reddened area.	166	(37.2)	258	(57.8)	.39	.489
8. Skin, macerated from moisture, tears more easily.	388	(87.0)	58	(13.0)	.87	.337
9. Pressure ulcers are sterile wounds.	43	(9.6)	403	(90.4)	.90	.295
10. A pressure ulcer scar will break down faster than unwounded skin.	373	(83.6)	73	(16.4)	.84	.370
11. A blister on the heel is nothing to worry about.	16	(3.6)	430	(96.4)	.96	.186
12. All care given to prevent or treat pressure ulcers must be documented.	419	(93.9)	27	(6.1)	.94	.239
13. Shear is the force which occurs when the skin sticks to a surface and the body slides.	236	(52.9)	210	(47.1)	.53	.500
14. A low Braden score is associated with increased pressure ulcer risk.	190	(42.2)	256	(57.4)	.43	.495
15. The skin is the largest organ of the body.	287	(86.8)	59	(13.2)	.87	.339
16. Educational programs may reduce the incidence of pressure ulcers.	411	(92.2)	35	(7.8)	.92	.269

Respondents' Score on PUKT : Items on Preventive Interventions for PU

Table 4.1.7 shows respondents' score on preventive interventions for PU. From the table, many wrong interventions were marked as correct. For example, 434 (97.3%) marked massage of bony prominences (Item 2) as a correct intervention, while only 12 (2.7%) marked massage of bony prominences as a wrong intervention. On the use of corn starch powder, transparent dressings, etc. (Item 3), 342 (76.7%) were also wrong. The use of doughnut devices/ring cushions (Item 8) was also erroneously indicated as a correct intervention by 422 (94.6%) respondents. Placing clients on side lying position at 30 degrees (Item 9) was correctly marked by 168 (37.7%), however only 40 (9.0%) correctly marked that bony prominences (Item 17) should not be in contact with each other. Respondents understood the importance of posting a turning schedule on the bedside (Item 6) as indicated correctly by 417 (93.5%) respondents. The importance of keeping the epidermis dry (Item 14) was correctly marked by 419 (93.9%) respondents. Most of the respondents correctly marked that every person at risk for PU should be placed on a pressure-reducing bed surface (400; 89.7%).

Table 4.1.7: Respondents' Score on PUKT : Items on Preventive Interventions for PU

N=446

	Statements on Preventive Interventions	Correct		Incorrect		Mean	SD
		No	%	No	%		
1.	Hot water and soap may dry the skin and increase the risk for pressure	217	(51.3)	229	(48.7	.59	.500
2.	It is important to massage bony prominences.	12	(2.7)	434	(97.3)	.97	.162
3.	Corn starch, creams, transparent dressings (i.e., Tegaderm, Opsite), ar dressings (i.e., DuoDerm, Restore) do not protect against the effects o	104	(23.3)	342	(76.7)	.77	.423
4.	An adequate dietary intake of protein and calories should be maintain illness.	427	(95.7)	19	(4.3)	.96	.202
5.	Persons confined to bed should be repositioned every 3 hours.	11	(2.5)	435	(97.5)	.98	.155
6.	A turning schedule should be written and placed at the bedside.	417	(93.5)	29	(6.5)	.93	.247
7.	Heel protectors relieve pressure on the heels.	17	(3.8)	429	(96.2)	.96	.196
8.	Donut devices/ring cushions help to prevent pressure ulcers	24	(5.4)	422	(94.6)	.95	.226
9.	In a side lying position, a person should be at a 30-degree angle with t	168	(37.7)	278	(62.3)	.62	.485
10.	The head of the bed should be maintained at the lowest degree of elev (hopefully, no higher than a 30 degree angle) consistent with medical	134	(30.0)	312	(70.0)	.70	.459
11.	A person who cannot move self should be repositioned while sitting ir two hours.						
12.	Persons who can be taught should shift their weight every 30 minutes a chair.	28	(6.3)	418	(93.7)	.94	.244
13.	Chair-bound persons should be fitted for a chair cushion.	33	(7.4)	413	(92.6)	.93	.262
14.	The epidermis should remain clean and dry.	385	(86.3)	61	(13.7)	.86	.344
15.	To minimize the skin's exposure to moisture on incontinence, underpa used to absorb moisture.	419	(93.9)	27	(6.1)	.94	.239
16.	Rehabilitation should be instituted if consistent with the patient's over therapy.	396	(88.8)	50	(11.2)	.89	.319
17.	Bony prominences should not have direct contact with one another.	405	(90.8)	41	(9.2)	.91	.289
18.	Every person assessed to be at risk for developing pressure ulcers sho on a pressure-reducing bed surface.	40	(9.0)	406	(91.0)	.91	286
19.	A pressure relieving surface reduces tissue interface pressure below ca pressure.	400	(89.7)	46	(9.0)	.90	.304
20.	A good way to decrease pressure on the heels is to elevate them off th	157	(45.2)	289	(64.8)	.65	.478
21.	Vascular boots protect the heels from pressure.	82	(18.4)	364	(81.5)	.82	.388
		213	(47.8)	233	(52.2)	.48	.500

Respondents' Knowledge of PU Staging

Table 4.1.8. shows respondents' knowledge on staging of PU. From the findings, 300 (67.3%) correctly defined stage I PU. However, only 68 (15.2%) could correctly define a stage II PU as a partial thickness skin loss, while a larger percentage 374 (84.8%) could not correctly defined a stage II pressure. To the respondents, a stage II PU is a full thickness skin loss.

Table 4.1.8: Respondents' Knowledge of PU Staging (N=446)

Items on Staging	Correct		Incorrect		Mean	SD
	No	%	No	%		
A stage I PU is non blanchable erythema	300	(67.3)	146	(32.7)	.67	.470
A stage III is a partial thickness skin loss involving the epidermis and/or dermis.	401	(89.9)	45	(10.1)	.90	.302
Stage IV PUs are full thickness skin loss with extensive destruction , tissue necrosis or damage to muscles, bone or supporting structure.	393	(88.1)	53	(11.9)	.88	.324
Stage II PUs are full thickness skin loss	68	(15.2)	378	(84.8)	.85	.360
Stage II PUs may be extremely painful due to exposure to nerve endings.	328	(73.5)	118	(26.5)		

Research Question 1. What is the baseline knowledge of PU preventive strategies among nurses in the survey group

Table 4.1.9. shows the distribution of the cumulative knowledge score of respondents on preventive strategies for pressur ulcer. As indicated, 169 (37.9%) nurses obtained low scores on pressure ulcer knowledge test (PUKT), having scored below 50% of correct responses. Those who obtained moderately high scores are 105 (23.5%), with a range of 51-69 correct responses. Those who obtained high scores (>70%) on the PUKT are 172 (38.6%).

Table 4.1.9. Respondents' Cumulative Score on the PUKT

Knowledge Level	**Frequency**	**Percentage**
Low Knowledge	169	37.9
Moderate Knowledge	105	23.5
High Knowledge	172	38.6
Total	**446**	**100**

Research Question 2. What is the association between knowledge of PU preventive intervention and level of education and previous exposure to PU continuing education among nurses in the survey group?

Table 4.1.10a shows the association between respondents knowledge of PU prevention strategies with educational level. In order to determine the association, Spearman rank correlation was used, and the correlation coefficient obtained shows that a very weak positive correlations exist between educational level and respondents' score on PUKT. On the other hand, the S tailed asymptotic statistic value ($p = 0.013, < 0.05$) justifies the existence of association between educational level and respondents' score. This is to say that as respondents improve their educational level they are likely to obtain higher scores on PUKT which will indicate a higher knowledge of PU prevention.

Table 4.1.10a: Spearman correlation between educational level and respondents' Knowledge Score on PUKT

Variables	N	Correlation Coefficient	P Value	Remark
Educational Category	446	1.000	.013*	Significant
Computed Knowledge Score	446	.117*		

Correlation is significant at 0.05 level

Table 4.1.10b shows the correlation between previous exposure to PU continuing education and respondents' score on PUKT. Results indicate a perfect correlation between knowledge score on PUKT and previous exposure to PU education ($P<0.05$) among participants. This suggests that previous exposure contributed to the performance of the group.

Table 4.1.10 b. Correlation between previous exposure to PU continuing education and respondents' score on PUKT

		Computed Knowledge Score	Previous exposure to PU
Computed Knowledge Score	Pearson Correlation	1	-.093*
	Sig. (2-tailed)		.049
	N	446	446
Previous PU exposure	Pearson Correlation	-.093*	1
	Sig. (2-tailed)	.049	
	N	446	446

*. Correlation is significant at the 0.05 level (2-tailed).

Results from Quasi-Experimental Study (Phase II)

Demographic Characteristics of Respondents in Quasi-Experimental Study

The mean age and the years of experience in direct patient care of respondents in the quasi-experimental study were assessed. These are presented on the tables 4.2.1 and 4.2.2 .

Table 4.2.1. shows the group mean age of respondents in the intervention and the control groups. Results indicate that respondents in the intervention group are within the mean age of 36.8 ± 10.3; $p<0.05$, while in the control group the mean age is 35.2± 11.9, $p< 0.05$. This suggests that there is no significant difference in the mean ages of respondents in the intervention and control groups.

The mean years of experience in direct patient care among respondents in intervention and control groups are presented in table 4.2.2. From the table, among the respondents in the intervention group, the mean years of experience in direct care were 14.5±13.7, $p< 0.05$. In the control group, the mean years of experience in direct patient care were 12.6± 12.0 years, $p< 0.05$. This means that there is no significant difference in the years of experience in direct patient care between intervention and control groups.

Table 4.2.1: Showing the Mean Age of Respondents in Intervention and Control Groups

Group	N	Mean	Std.Deviation	Sig. (2-tailed)
Age:				
Intervention	127	36.8	10.3	.340
Control	66	35.2	11.9	.362

Table 4.2.2: Mean Years of Experience in Direct Care by Respondents in Intervention and Control Groups

	Group	N	Mean	Std. Deviation	Sig. (2-tailed)	Mean Difference
Years of Experience in Direct care	Intervention	127	14.47	13.741	.348	1.882
	Control	66	12.59	12.042	.329	1.882

Research Question 3: What are the common nursing strategies for assessment and management of risk to prevent pressure ulcers among nurses in intervention and control groups?

Table 4.2.3 shows the common nursing practices used by nurses to assess and to manage risk for pressure ulcer. To obtain the most commonly used interventions, the practices were ranked based to the highest mean . From the table, the most common intervention used by nurses to manage risk for PU is two hourly repositioning schedule for bedfast patients (Mean= 3. 69;± .65). This is followed by application of talcum powder to vulnerable area (Mean=3.67;± .68 . The massaging of bony prominences was rated as the third in the hierarchy of common interventions used (Mean= 3.64; ±.74). Other interventions were rated and ranked according to the mean scores as follows:

- Patients' level of risk was measured based on nurses clinical judgment and experience only. (Mean=3.50;±.79).
- Head of bed are elevated (medium fowlers) for patients comfort.(Mean=3.50±.85).
- Devices like trapeze, bed rails used to promote independent positioning (Mean= 3.46±.84).
- Skin assessment is carried out on every patient on admission (Mean= 3.45±.82).
- Standard mattresses are used for vulnerable patients(Mean= 3.11±.74)
- Patients are lifted without lift sheets across the bed to facilitate repositioning (Mean=2.15±.66).

However, the least used intervention was risk assessment scales to predict risk on all patients on admission (Mean = 2.62; ±.92).

Table 4. 2. 3 Most Commonly Used Interventions For PU Prevention. N=193.

S/N	Nursing Interventions	MU No %	OU No /%	NU No /%	DN No /%	Mean	Std Dev	Rank
1.	Risk assessment scales to predict risk on all patients on admission	44 (22.8)	46 (23.8)	88 (45.6	15 (7.8)	2.62	.92	**11**
2.	Patients level of risk assessed only by nurses clinical judgment and experience	122 (63.2)	54 (28.0)	8 (4.1)	9 (4.7)	3.50	.79	5
3.	Skin assessment is carried out on every patient on admission	46 (23.8)	120 (62,2)	20(10.4)	7 (3.6)	3.45	.82	**8**
4.	Application of talcum powder to vulnerable areas.	148 (76.7)	32 (16.6)	8 (4.1)	5 (2.6)	3.67	.68	**2**
5.	Two hourly repositioning schedule for all bed fast patients	149 (77.2)	34 (17.6)	5 (2.6)	5 (2.6)	3.69	.65	**1**
6.	Lifting patients without lift sheets across the bed for repositioning(dragging)	13 (6.7)	144 (74.6)	19 (9.8)	17 (8.8)	2.15	.66	**10**
7.	Head of bed are elevated (medium fowlers) for patient comfort.	129 (66.8)	43 (22.3)	9 (4.7)	12 (6.2)	3.50	.85	**5**
8.	Pillows are used on bony prominences to reduce tissue load	149 (77.2)	29 (15.0)	7 (3.6)	8 (4.1)	3.65	.74	**3**
9.	Standard mattresses are used for vulnerable patients	85 (44)	60 (31.1	33 (17.1)	15 (7.8)	3.11	.96	**9**
10.	Massage of bony prominences In at-risk patients	147 (76.2)	30 (15.5	9 (4.7)	7 (3.6)	3.64	.74	**4**
11.	Devices like trapeze, bed rails to promote independent positioning	123 (63.7)	46 (23.8)	14 (7.3)	10 (5.2	3.46	.84	**7**

KEY : Mostly Used (MU), Occasionally Used (OU) , Not Used at all (NU) , Don't know(DK)

Research Question 4: What are the factors which hinder preventive interventions for PU in the intervention and control hospitals?

The opinion of respondents on factors which hinder the practice of preventive interventions for PU in both control and intervention group was assessed and presented on table 4.2.4. The items were ranked from the highest to lowest mean.

From the table, item 1, inadequate manpower, constitutes the greatest problem (Mean =4.69,± .69). This is followed closely by inadequate supply of linens on the wards (Mean = 4.03, ±1.09). Commitment of the hospital management to PU prevention was rated as the least hindrance to practice by the respondents in the three hospitals (Mean =3.37, ± .45). Other hindrances as rated by the respondents include: lack of pressure redistribution appliances which ranked 3rd on the list of problems (Mean =3.96; ±1.21). This was followed by lack of disposable materials (Mean=3.88; ±1.24). Overcrowding on the wards was also noted to be a problem and was ranked 5th on the list (Mean = 3.76; ±1.29). Respondents in this study rated lack of access to relevant literature on PU prevention as a hindrance (Mean = 3.70; ± 1.21). Inadequate knowledge of evidence-based practices and existent assessment tools were ranked as the 7th factors which hinder preventive interventions (Mean = 3.52; ± 1.16; 1.34) respectively. Respondents also noted that non-availability of written down standard of practice for PU prevention was a hindrance (Mean = 3.45; ±1.43). Nurses' independent clinical decision making was ranked 10th on the list, and considered the least of the hindrances (Mean = 3.44; ±1.33).

Table 4.2. 4: Respondents' Opinion of Factors which Hinder PU Preventive Interventions in intervention and control hospitals

N= 193.

SN	Items	SA (5)	A (4)	D (3)	SD (2)	UN (1)	Mean	Std Dev.	Rank
1.	Inadequate manpower	151(78.2)	33(17.1)	5(2.6)	1(.5)	3(1.6)	4.69	.69	**1**
2.	Overcrowding in the wards	74(38.3)	49(25.4)	37(19.2)	16(8.3)	17(8.8)	3.76	1.29	**5**
3.	Lack of adequate linens on the wards	83(43,0)	59(30.6)	35(18.1)	6(3.1)	10(5.2)	4.03	1.09	**2**
4.	Lack of written down standard of practice for PU prevention in the hospital	59(30.6)	49(25.4)	37(19.2)	15(7.8)	33(17.1)	3.45	1.43	**9**
5.	Lack of disposable materials	73(37.8)	69(35.8)	24(12.4)	8(4.1)	19(9.8)	3.88	1.24	**4**
6.	Lack of access to relevant literature	56(29.0)	69(35.8)	42(21.8)	7(3.6)	19(9.8)	3.70	1.21	**6**
7.	Inadequate knowledge of evidence –based practices	43(22.3)	62(32.1)	55(28.5)	18(9.3)	15(7.8)	3.52	1.16	**7**
8.	Poor knowledge of an existent assessment tool	46(23.8)	65(33.7)	47(24.4)	14(7.3)	21(10.9)	3.52	1.34	**7**
9.	Lack of nurses' independence in clinical decision making	52(26.9)	50(25.9)	46(23.8)	21(10.9)	24(12.4)	3.44	1.33	**10**
10.	No pressure redistribution appliances	78(40.4)	73(37.8)	16(8.3)	9(4.7)	17(8.8)	3.96	1.21	**3**
11.	No commitment to PU prevention by hospital management	50(25.9)	62(32.1)	30(15.5)	12(6.2)	39(20.2)	3.37	1.45	**11**
12	Lack of nurses' independence in clinical decision making	52(26.9)	50(25.9)	46(23.8)	21(10.9)	24(12.4)	3.44	1.33	**10**
13	No pressure redistribution appliances	78(40.4)	73(37.8)	16(8.3)	9(4.7)	17(8.8)	3.96	1.21	**3**
14	No commitment to PU prevention by hospital management	50(25.9)	62(32.1)	30(15.5)	12(6.2)	39(20.2)	3.37	1.45	**11**

15.	Lack of nurses' independence in clinical decision making	52(26.9)	50(25.9)	46(23.8)	21(10.9)	24(12.4)	3.44	1.33	**10**
16.	No pressure redistribution appliances	78(40.4)	73(37.8)	16(8.3)	9(4.7)	17(8.8)	3.96	1.21	**3**
17.	No commitment to PU prevention by hospital management	50(25.9)	62(32.1)	30(15.5)	12(6.2)	39(20.2)	3.37	1.45	**11**

Research Question 5: How comparable are the risk-based interventions used among nurses in the intervention and control hospitals?

Interventions used to prevent PU were compared across the hospitals which make up the intervention and control groups. This was done to note specific differences in practice. The intervention (experimental) hospitals were LASUTH (I) and UCH (II). The control hospital was OUATHC, Ife. Findings are presented on table 4.2.5.

From table 4.2.5, use of risk assessment scales for prediction of level of risk is more commonly used in LASUTH (Mean=2-87; ± 1.05) than UCH (Mean =2.39; ±.89) and OAUTHC (Mean=2.42;± .81) respectively.

Assessing level of risk by nurses' clinical judgment is also used more often in LASUTH (Mean= 3.57;± .71). Conducting skin assessment on every patient on admission is carried out more in UCH (Mean=3.58; ±.75), this is followed by LASUTH (Mean= 3.46; ±.76). However, this intervention is least practised in the control hospital (OAUTHC) (Mean= 3.29; ±.92). Application of talcum powder to vulnerable areas is marked to be mostly practised in UCH (Mean = 3.73; ±.56). The use of two hourly repositioning schedule for bed fast patients appears to be a common practice across the 3 hospitals with slight variations in the mean scores thus: UCH (Mean= 3.77; ±.60), LASUTH (Mean= 3.70; ±.60), OAUTHC (Mean= 3.61; ±.78) respectively.

Lifting patients without lift clothes across the bed to facilitate turning is the least practised of all the interventions by nurses in the experimental and control hospitals. The mean scores are similar in LASUTH and UCH (Mean= 2.18; ± .66), and lower in the control hospital (Mean=2.08; ±.66).

Elevating patients' head of bed to medium fowler is practised more in UCH (Mean= 3.59; ± .74) as compared to LASUTH and OAUTH (Mean = 3.57; ±.74; Mean= 3.33; ± 1.03) respectively.

The use of pillows over bony prominences to reduce tissue load is most practised in UCH (Mean= 3.72;±.68) as compared to nurses in LASUTH (Mean= 3.71;±.68).

Nurses in the 3 settings massage bony prominences in at-risk patients. The Mean scores are very comparable. However, the nurses in UCH obtained highest mean score for this practice (Mean= 3.68; ±.65). The scores in LASUTH and OAUTHC are similar (Mean=3.62;±.80).

Table 4.2.5: Comparison of Respondents' Preventive Practices in the Experimental and Control Hospitals

SN	Interventions	Statistics	Intervention Hosps (I&II.) I N=56	II N=71	Control N= 66
1.	Risk assessment scales to predict risk for PU on all patients on admission.	Mean	2.87	2.59	2.42
		SD	1.05	.89	.81
2	Patients' level of risk is based only on nurses' clinical judgment and experience	Mean	3.57	3.61	3.32
		SD	.71	.64	.95
3	Skin assessment is carried out on every patient on admission.	Mean	3.46	3.58	3.29
		SD	.76	.75	.92
4	Application of talcum powder to vulnerable areas	Mean	3.68	3.73	3.61
		SD	.69	.56	.78
5	Two hourly repositioning schedule for bed fast patients	Mean	3.70	3.77	3.61
		SD	.60	.51	.80
6	Patients are lifted without lift sheets across the bed to facilitate turning.	Mean	2.18	2.18	2.08
		SD	.66	.66	.66
7	Head of bed is elevated (medium fowlers) for patients' comfort.	Mean	3.57	3.59	3.33
		SD	.74	.74	1.03
8	Pillows are used on bony prominences to reduce tissue load.	Mean	3.71	3.72	3.53
		SD	.68	.64	.88
9	Standard mattress are used for vulnerable patients	Mean	3.34	2.96	3.09
		SD	.84	.95	1.03
10	Massage of bony prominences in at-risk patients.	Mean	3.62	3.68	3.62
		SD	.80	.65	.78
11	Devices like trapeze, bed rails to provide independent positioning.	Mean.	3.48	3.46	3.44
		SD	.74	.83	.95

KEY: Intervention Hospitals I : LASUTH II :UCH

Research question 6: What is the point-prevalence of PU among patients in selected wards pre and post 12 weeks intervention in experimental and control hospitals?

Research question 6 examined the point-prevalence of PU among patients in the selected wards where nurses who are working in those wards attended the workshop on PU prevention. This was done to measure the effect of nurses' knowledge of PU prevention strategies on patients' clinical outcome post intervention. Findings were compared with those in the control group who did not attend similar workshop. The formula to calculate the point prevalence of pressure ulcer is :

Number of patients with PU at time of study divided by the total number of patients surveyed.

The results are presented on tables 4.2.6, 4.2.7, and 4.2.8.

Table 4.2.6 shows the point-prevalence for PU pre and post intervention in UCH. From the table, at the beginning of study the point-prevalence of PU in the selected wards in UCH is 0.30 and at the end of 12 weeks of study , the point-prevalence is 0.29

Table 4.2.7 shows the point prevalence of PU in selected wards in LASUTH. From the table, the point-prevalence reduced from 0.21 at the beginning of study to 0.1 at the end of 12 weeks.

Table 4.2.8 shows the point prevalence of PU in the control hospital, OAUTHC. Data shows that at the beginning of study, the point-prevalence is 0.12. At the end of 12 weeks, an increase from baseline was observed : 0.17.

Table 4.2. 6. Point-Prevalence of PU in Selected Wards in UCH, Ibadan

Beginning of study Wards/ Date	**Number of patients at time of study**	**Number with PU during study**	**Calculated point-prevalence**
17/12/2012.			
North West 1	**22**	**12**	
South East 1	**27**	**5**	
South West 3	**22**	**4**	
Total	**71.0**	**21.0**	**0.30**
End of study:17/3/2011			
North West 1	**21**	**10**	
South East 1	**27**	**5**	
South West 3	**25**	**6**	
Total	**73**	**21**	**0.29**

Table 4.2.7 : Point Prevalence of PU in Selected Wards in LASUTH. Lagos

Beginning of study Wards/ Date 27/11/2010	**Number of patients at time of study**	**Number with PU during study**	**Calculated point prevalence**
BT Otho (male & Female	20	5	
BT cardio&Neuro (male &Female	15	3	
Male medical A&B	18	3	
Total	**53**	**11**	**0.21**
End of study: 28/3/2011			
BT Otho(male & Female	25	3	
BT cardio &Neuro (male & Female	20	3	
Male medical A&B	15	2	
Total	**60**	**8**	**0.1**

Table 4.2.8: **Point-Prevalence of PU in Selected Wards in OAUTHC, Ile-Ife**.

Beginning of study Wards/ Date 18/9/2011	**Number of patients at time of study**	**Number with PU during study**	**Calculated point-prevalence**
Male surgical wards I&II	17	Nil	
Adult Othopedic Male &Female	30	5	
Female medical ward I&II.	17	2	
Total	**64**	**7**	**0.12**
End of study: 19/12/2011			
Male surgical wards I&II	25	2	
Adult Orthopedic Male &Female	25	6	
Female medical ward I&II.	20	4	**0.17**
Total	**70**	**12**	

Table 4.2.9: Summary of Point Prevalence of PU in selected wards pre and post 12 weeks intervention in experimental and control hospitals.

Hospitals	Point Prevalence pre Intervention	Point Prevalence 3months post Intervention	Difference/ remarks
UCH	0.30	0.29	No difference
LASUTH	0.21	0.1	Decreased point prevalence
OAUTHC	0.12	0.17	Increased point prevalence of PU

Comparison of Means of PU Point-prevalence in Intervention and Control Hospitals before and after Intervention

In order to answer research question 6 and to determine if there was a statistically significant difference in the point prevalence of PU between intervention and control groups before and after intervention, a paired sample t- test was used and is presented on table 4.2.10.

From the table, IG indicates before-after intervention in intervention (experimental) group while and CG indicates before-after intervention in the control group. Result shows that the mean point-prevalence of PU in the intervention group before-after intervention was -1.7±4.2, t= -1.187, > 0.05.

In the control group, the mean point-prevalence of PU was .00± 1.6, t=.000 < 0.05.

Result shows no significant difference in point-prevalence of PU between intervention and control groups ($p<0.05$).

Table 4.2.10: **Comparison of Means of PU Point-Prevalence in Intervention and Control Hospitals before and after intervention**

Paired Samples t-Test

		Paired Differences							
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	Sig. (2-tailed)
IG	before – after	-1.66667	4.21307	1.40436	-4.90512	1.57179	-1.187	8	.269
CG	before – after	.00000	1.60357	.56695	-1.34062	1.34062	.000	7	1.000

IG: Intervention Group. CG: Control Group

HYPOTHESES TESTING

Hypothesis 1: There is no significant effect of educational intervention on nurses' knowledge of risk assessment and preventive strategies between experimental and control groups.

Table 4.2.11. shows the mean knowledge scores of respondents in both intervention and control groups at pretest, immediate posttest and three months posttest.

From 4.2.11, respondents in both intervention and control groups have comparable baseline knowledge level for PU prevention . In the Intervention group, the mean knowledge at pretest (baseline) is 32.5±4.2, while in the control group, the baseline knowledge is 30.8±5.0. At the immediate posttest, knowledge of respondents in the intervention group increased from baseline to Mean=40.7± 3.4 while in the control, a slight increase was observed Mean=31.2±5.2. At three months post intervention, additional increase in knowledge is observed in the intervention group (Mean= 42±4.0) and in the control group (Mean=.37.8±5.6.)

From same table, a comparison of respondents' knowledge score in the intervention group at pretest, immediate posttest and at three months posttest shows that the mean score at pretest is 32.5 ± 4.2. The score increased to 40.7, ±3.4 immediately after intervention ($p<0.05$). At three months, the mean knowledge score increased to 42.7±4.0 ($p<0.05$) , indicating that there is an effect of the educational intervention on nurses knowledge on PUKT.

Table 4.2.11: Mean Knowledge Score at Pretest, Immediate Posttest and Three Months Posttest in Intervention and Control Groups.

Test	Groups	N	Mean	SD
Pretest: Score	**Intervention Group**	127	32.5	4.2
	Control Group	66	30.8	5.0
Immediate Posttest: Score	**Intervention Group**	127	40.7	3.4
	Control Group	66	31.2	5.2
3 months posttest: Score	**Intervention Group**	125	42.7	4.0
	Control Group	53	37.8	5.6

To test HoI, paired sample t-test was conducted to determine the mean difference in knowledge score between the intervention and the control groups pre and post intervention.

Table 4.2.12 shows the result of paired comparison of the respondents' knowledge scores at pretest and immediate posttest, pretest and three months posttest and immediate posttest and three months posttest using a paired sample -t test.

From the table, the mean difference in knowledge score at pretest and immediate posttest among the intervention group is -8.2 ±5.4, t= -17.0, p=.000; $p<0.05$. This shows a significant increase in knowledge from baseline to immediate post intervention, therefore the Ho was rejected.

Similarly, there is a significant increase in mean score from immediate posttest to 3 months posttest in the intervention group (Mean= -2.0± 5.5, t= -4.1, p=.000; $p<0.05$. Therefore, the Ho1 was rejected. The increased mean difference in knowledge score from baseline to immediate posttest in intervention group (8.2±5.4) was significantly higher than that observed in the control group (0.4 ±2.2); ($p<0.05$).

Table 4.2.12 Continued : Comparison of Respondents' Knowledge Score at Baseline, Immediate Posttest and at 3months Posttest in the Intervention and Control Groups.

Test	Groups	N	Mean	SD	Mean diff/SD.	t-value	P-value	Remarks
Pretest & Immediate posttest score	**IG**	127	32.5	4.2	-8.2 (±5.4)	-17.0	0 .000	Significant
	CG	66	30.8	5.0	0.4 (±2.2)	-1.4	0 .167	Not significant
Pretest & 3 months Posttest	**IG**	127	42.7	4.1	-10.0(±5.6)	-20.1	0.000	Significant
	CG	53	37.8	5.6	-6.2(7.2)	-6.3	0.000	Significant
Immediate Posttest & 3 months Posttest	**IG**	125	42.7	4.0	-2.0 (±5.5)	-4.1	0.000	significant
	CG	53	37.8	5.6	-6.2 (7.2)	-6.3	0.000	significant

KEY: IG : INTERVENTION GROUP. CG: CONTROL GROUP

Hypothesis 2: There is no significant effect of selected demographic characteristics (years of experience, professional cadre, educational level, previous exposure to PU lecture) on posttest score of nurses in the experimental and control groups.

Table 4.2.13 shows the effect of selected demographic characteristics on immediate posttest knowledge scores of respondents. From the table, the effect of years of experience on posttest score in both experimental and control groups is not significant. (P=.275; >0 .05). Therefore, the null hypothesis is not rejected. This indicates that there is no significant effect of years of experience on posttest score of respondents.

Also from table 4.2.13, the effect of professional cadre on posttest score in both experimental and control groups is not significant (p = .058; >0 .05). Therefore, the null hypothesis is not rejected. This means that professional cadre did not significantly determine the score of respondents at posttest.

The effect of previous exposure to PU lecture on posttest score is also shown on table 4.2.13, and indicates a no significant difference (p=.372; >0 .05). Therefore, the evidence not to reject the null hypothesis. This means that previous exposure to PU lecture did not significantly determine the score at posttest.

Table 4.2.13. also shows the effect of educational level on posttest score in experimental and control groups. Findings was not significant (p=.684; >.05); therefore null was not rejected.

Table 4.2.13: Summary of Analysis of Variance Showing Effect of Intervention and Selected Demographic Characteristics on Posttest Scores

Dependent Variable: Immediate Posttest Knowledge Score					
Source	Type III Sum of Squares	Df	Mean Square	F	**Sig.**
Corrected Model	4152.508[a]	52	79.856	5.702	**.000****
Intercept	17502.727	1	17502.727	1249.670	**.000****
Intervention	407.377	2	203.688	14.543	**.000****
Years of Experience	36.522	2	18.261	1.304	.275
Professional Cadre	131.854	4	32.963	2.354	.058
Previous PU Lecture	27.964	2	13.982	.998	.372
Educational Level	10.664	2	5.332	.381	.684

Hypothesis 3: There is no significant interaction effect of treatment, professional cadre, previous PU lecture on posttest score in experimental and control groups.

One way analysis of variance (ANOVA) was used to determine the interaction of intervention with selected demographic characteristics of respondents in intervention. The results are shown in table 4.2.14.

From table 4.2. 14 the interaction effect of treatment and selected demographic characteristics indicates the following:

1. The interaction effect of treatment with years of experience was not significant (p= .270; >.05); therefore, the null hypothesis was not rejected.
2. The interaction effect of treatment with professional cadre was not significant (p=.175;>.05).
3. The interaction effect of treatment with previous PU lecture was significant (p= .030; <.05). Therefore, the decision to fail to reject the null hypothesis. This means that there is a significant interaction effect of treatment with previous exposure to PU lectures. Treatment reinforces previous education on PU.
4. The interaction effect of treatment with educational level was not significant (p= .930; >.05).

Table4.2.14: Summary of Analysis of Variance Showing Interaction Effect of Intervention and Selected Demographic Characteristics on Posttest Scores

	Dependent Variable: Immediate Posttest Knowledge Score				
	Sources of Variation				
		Sum of Squares	Df	Mean Square	F	**Sig.**
2-way Interactions	Intervention X Yrs of Experience	73.391	4	18.348	1.310	.270
	Intervention X Professional Cadre	164.749	8	20.594	1.470	.175
	Intervention X Previous PU Lecture	155.795	4	38.949	2.781	**.030***
	Intervention X Educ. Level	11.990	4	2.997	.214	.930

Hypothesis 4: There is no significant difference in the immediate posttest mean score and three months posttest score of nurses in Intervention and control groups.

In order to compare the mean scores obtained at immediate posttest and 3 months posttest, a paired sample t-test was conducted and presented on table 4.2.15.

In the intervention group, the immediate posttest score was Mean=40.7±3.4 and increased to 42.7±4.0, t=4.1 p=.000;p<0.05 at 3 months post intervention.

In the control group, the immediate posttest score Mean=31.2± 5.2 increased to Mean =37±6.2,t=6.3, p=.000 ,p<0.05 at 3 months posttest. The result shows a significant difference in scores obtained (p<0.005) in both intervention and control groups; therefore, the decision to reject Ho4.

Table 4.2.15: Showing Paired t-test of Immediate and 3 months Posttest between Intervention and Control Group

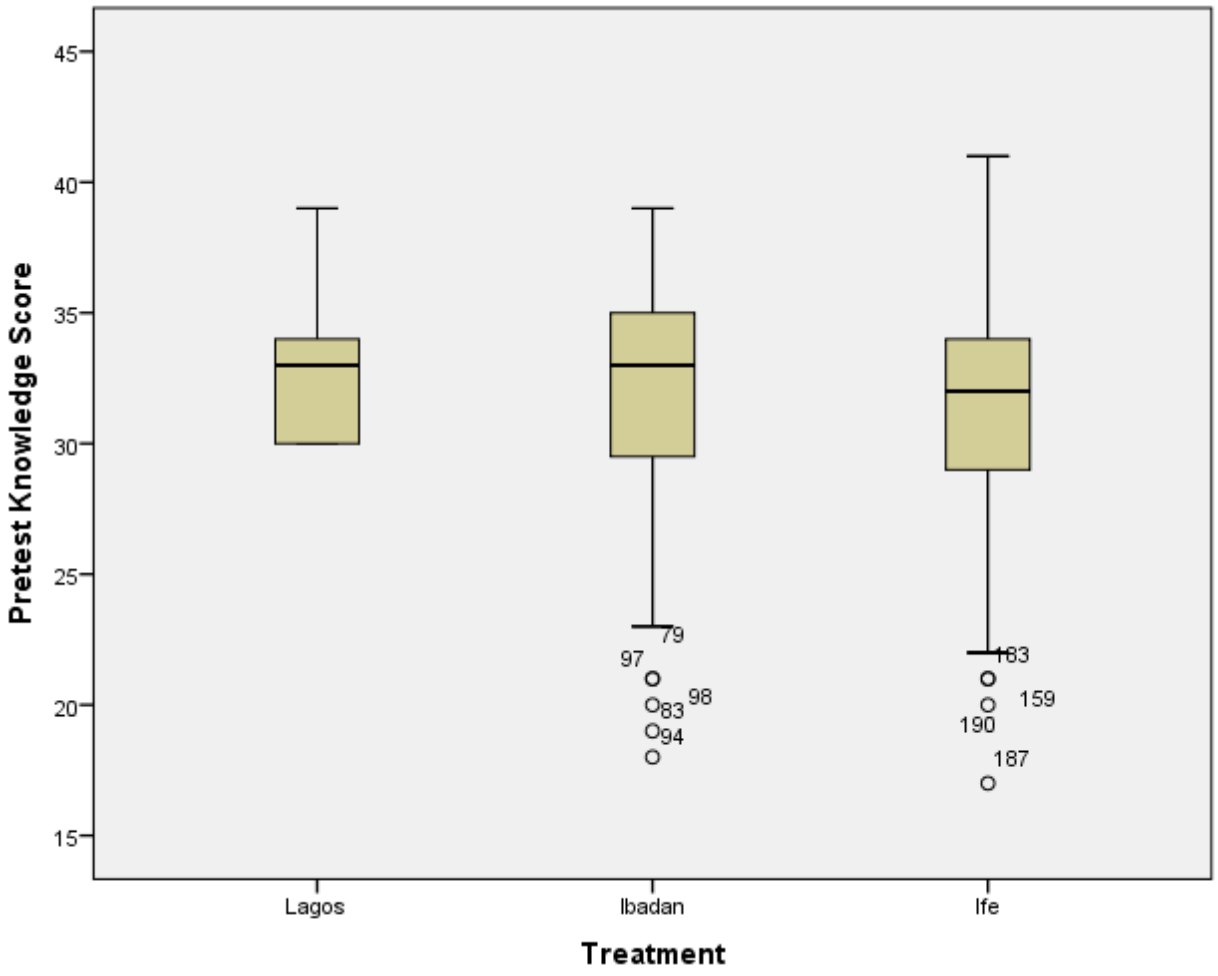
	Pair	Mean	N	Std Deviation	Std Error	t-value	df	p-value
Intervention Group	**Immediate Posttest**	40.7	127	3.4	.482	4.1	126	.000*
	3 Months Posttest	42.65	125	3.927	.487		124	
Control Group	**Immediate Posttest**	31.2	66	5.2	.990	6.3	65	.000*
	3 Months Posttest	37.8	53	6.2	.990		52	

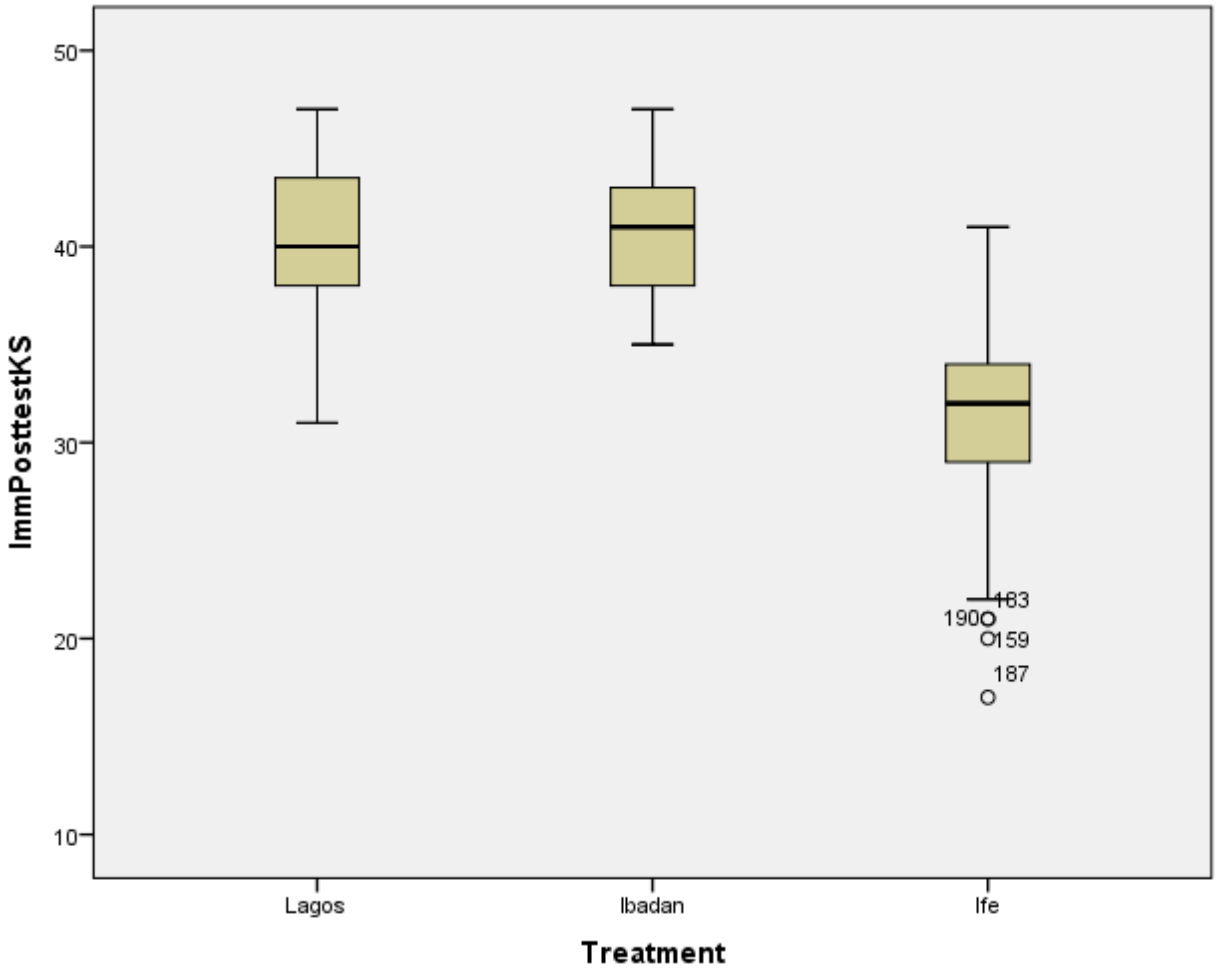
***Significant at p < .05**

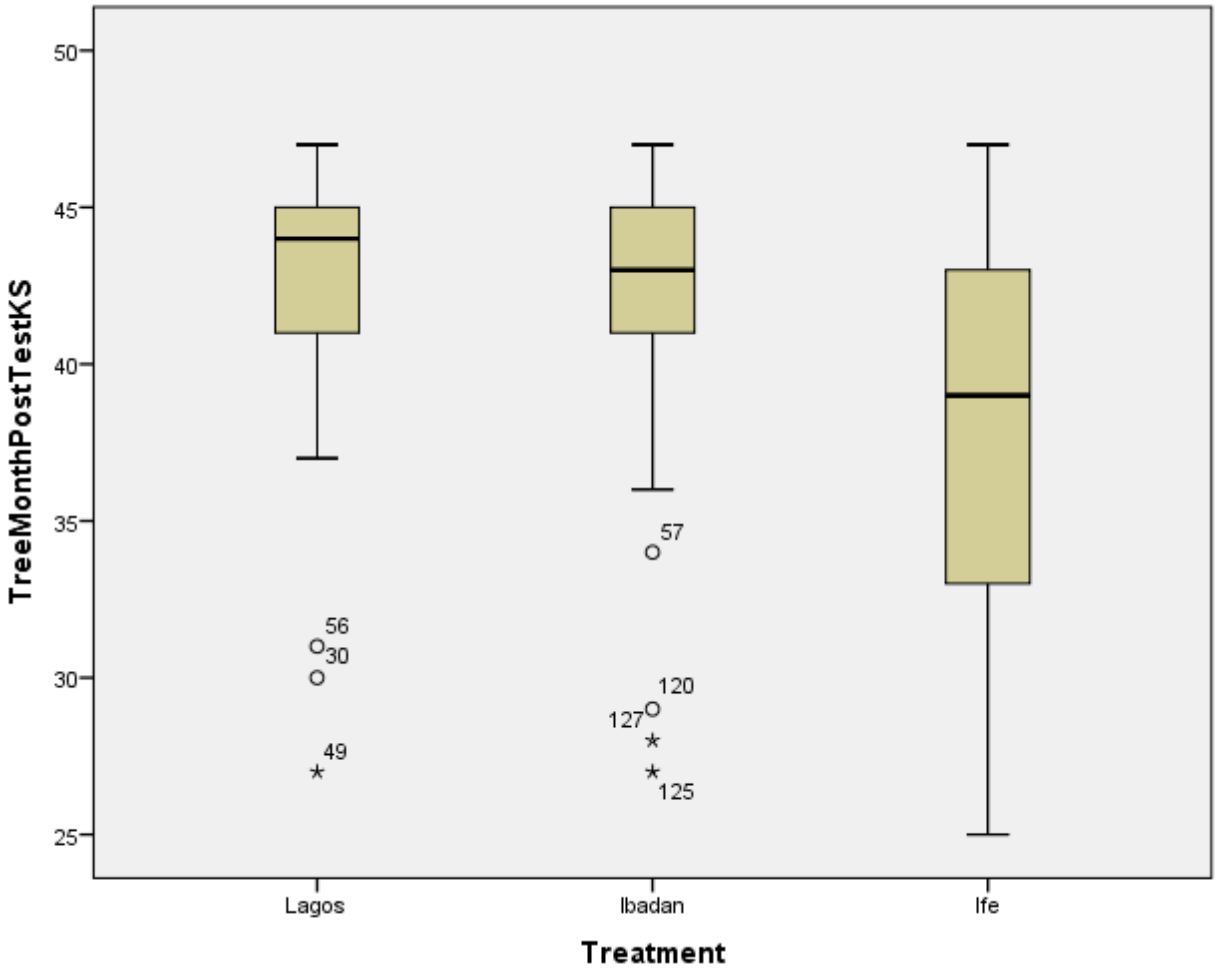
Pattern of Change in Knowledge from Baseline to Immediate Posttest and 3 Months Posttest among Respondents.

Figure 4.2.1 shows a graphic representation of the pattern of change in knowledge at pretest, immediate posttest and at 3 months post intervention. Result indicates that the change in knowledge level obtained at immediate posttest was retained at 3 months post intervention.

Figure 4.2.1: Respondents' Pattern of Change in Knowledge at Pretest, Posttest and 3 Months Posttest




ImmPosttestKS
50
40
30
20
10
183
190
159
187
Lagos
Ibadan
Ife
Treatment


TreeMonthPostTestKS
50
45
40
35
30
25
56
30
49
57
120
127
125
Lagos
Ibadan
Ife
Treatment

Hypothesis 5: There is no significant difference in nursing practice for PU prevention pre and post intervention between experimental and control groups.

The Mean Rank of Practice in Intervention and Control Groups was determined using the Mann-Whitney U and Wilcoxon Sign Rank Test . Result is presented on Table 4.2. 16 and, shows that the median rank for practice in both intervention and control is similar at baseline (97.0). At post intervention, the mean rank for practice increased among respondents in the intervention group to 105.0 and decreased in the control group 87.5 at 3 months. The test is significant in the intervention group and control group for both pre and post practice ($p<0.05$); therefore, Ho5 was rejected.

Table 4.2.16: Mean Rank of Practice in Intervention and Control Groups Pre and Post Intervention

Groups		N	Mean Rank	Sum of Ranks
Pretest: Intervention Group		127	97.00	10185.00
Control Group		66	97.00	8536.00
Total		**193**		
Posttest	**Intervention Group**	127	105.00	11025.50
	Control group	66	87.45	7695.50
	Total	**193**		

Test Statistics Mann-Whitney U and Wilcoxon Rank for Practice Pre and Post Intervention in Experimental Group

	Mann-Whitney U	Wilcoxon	Z	Asymp. Sig 2-tailed	Remarks
Pretest:	4620.000	8536.000	* .000	1.000	Significant
Posttest:	3779.500	7695.500	*-2.187	.029	Significant

P< .05

Summary of Findings

Respondents are mostly female and 168 (37.7%) are within the age bracket 31-40 years. Educationally, a higher percentage (69.1%) of respondents is diploma certified nurses with 36.1% at the professional rank of nursing officers. Data shows that 26% were experienced clinicians, having worked for 6-10years.

On respondents' previous participation in a PU prevention workshop, 302 (67.7%) had never attended such a workshop prior to this study. Among the few (32.3%) who have had such an exposure, 56.3% was between 1 and 5years prior to this study. A very large number 431(96.6%) nurses indicate current interest in participating in PU focused educational programme.

On the assessment of respondents' baseline knowledge on PU risk assessment and prevention using the Pressure Ulcer Knowledge Test (PUKT), majority of respondents in the survey study demonstrate good understanding of assessment items such as correctly identifying the risk factors for PU, and the importance of a systematic skin inspection at least once a week. However, 256 (57.4%) could not correctly interpret the Braden scale score (item 14, table4.1.6). On the assessment of respondents knowledge of preventive interventions, many wrong interventions were marked as correct. For example, massaging of bony prominences of at-risk patients was marked as correct intervention by 434 (97.3%) of respondents. Overall, 169 (37.9%) obtained low scores, 105 (23.5%) obtained moderate scores while 172 (38.6%) obtained high scores on the PUKT.

Research question 2 indicates a correlation between level of education and score on PUKT, with a statistical significant value ($p=0.013$; <0.05).

In the phase II of the study, the common nursing practices for PU prevention between intervention and control hospitals was two hourly repositioning schedule for bed fast patients. The least used intervention was risk assessment scales for predicting PU in patients on admission (Research Question 3).

Inadequate manpower was the factor which hindered preventive interventions in both experimental and control hospitals (Research Question 4).

Research question 5 examined the risk-based interventions used by nurses across the intervention and control hospitals. Data show that two hourly repositioning and application of talcum powder to vulnerable sites were mostly used in intervention hospital II (UCH).

Research question 6 evaluated the point-prevalence of PU among patients in the experimental and control groups. The point-prevalence across experimental and control hospitals before and after the study showed no statistical significance $p<0.05$.

Hypothesis 1: There is no significant effect of educational intervention on nurses knowledge of PU prevention strategies between experimental and control groups. Data showed Ho1 was rejected. Result of paired sample t-test indicated a significant increase in knowledge from immediate posttest to 3 months post intervention ($p<0.05$). This indicates that the intervention had effect on nurses knowledge of PU preventive interventions.

Hypothesis 2: There is no significant effect of selected demographic variables on posttest score in experimental and control groups. The null hypothesis was not rejected ($p>0.05$), indicating that the selected demographic characteristics (years of experience, professional cadre, previous exposure to PU lecture) did not significantly determine the respondents' score at posttest.

Hypothesis 3: There is no significant interaction effect of treatment , professional cadre, previous PU lecture on posttest score. The interaction effect of treatment with previous PU lecture was significant ($p=.030$; $<.05$). The interaction effect of treatment with educational level, years of experience and professional cadre was not significant ($p>0.05$).

Hypothesis 4: There is no significant difference in the immediate posttest mean score and the three months score of nurses in experimental and control groups. Findings were significant ($p=.000$; $< .05$). The Ho4 was rejected.

Hypothesis 5: There is no significant difference in nursing practice for PU prevention pre and post intervention between experimental and control groups. The mean rank for practice increased significantly in the intervention group at 3months post intervention ($p<0.05$); therefore, the Ho5 was rejected.

CHAPTER FIVE

5.0. Discussion of Findings

Pressure ulcer is not a new phenomenon but has been a nursing concern for several years. It is often considered to be indicative of the quality of nursing care; hence its prevention is a priority in practice. However, evidence from literature shows that the strategies for prevention of PU have frequently not been accorded the emphasis it deserves.

Florence Nightingale, over 150 years ago, wrote about the high mortality rate in city hospitals stating thus ‘

> … a vast deal of suffering in these establishments is from avoidable causes’
> (Nightingale, 1863).

It is a sad reflection on healthcare in the 21st century, to say that in some respect this statement remains true. In order to confirm and support the preventability of PUs , the European Pressure Ulcer Advisory Panel (EPUAP) noted that some PUs are avoidable health problems (NPUAP 2009). It therefore suggests that a focused education and training in PU prevention underscores the achievement of this goal.

The understanding and knowledge of interventions to prevent PU has become more critical today as the world is facing epidemiological transition towards management of chronic diseases, which increase patients’ predisposition to PU due to associated immobility and long hospital stay. Several data indicate that PU occurs as a complication of chronic illnesses that are associated with immobility and inactivity (Salcido, 2008, Orsted 2009). Therefore, a targeted action of early detection and implementation of preventive interventions is necessary.

Lyder (2003) noted that the presence of PU is a marker of poor overall prognosis and quality of care; and therefore, there is a universal agreement that PU prevention is a serious nursing concern. Nurses’ expertise, leadership and knowledge in PU prevention are very crucial, as this will facilitate the ability to design protocols, implement innovative solutions, and lead the charge for PU prevention. Literature maintains that in order to facilitate successful implementation of PU preventive protocols, a comprehensive educational programme is a sine qua non (Niederhauser, Lukas, Parker, Ayello, Zulkowski, Berlowitz, 2012).

The purpose of this study was to assess the level of nurses' knowledge of what is considered evidence-based interventions to prevent PUs, and to implement an educational programme to improve the nurses' knowledge for PU prevention. The study was conducted in two parts. The first part was a survey of nurses' knowledge of PU prevention using the Pressure ulcer Knowledge Test (PUKT). The second part was a quasi-experimental design which measured the effectiveness of an educational programme and the interaction effect of treatment with selected demographic characteristics of respondents. This study was guided by a quality improvement philosophy.

Nurses in this study were selected from three teaching hospitals thus: University College Hospital, Ibadan; Lagos State University Teaching Hospital and Obafemi Awolowo Teaching Hospital Complex, Ile-Ife. Teaching hospitals were chosen for this study because they provide care to increasingly critical and highly complex conditions, including patients with chronic illnesses. Such patients are more prone to complications which include impairment in skin integrity. In addition, because patients are increasingly aware of their rights to good quality care from healthcare institutions, it is therefore imperative for nurses practising in these complex environments to be constantly evaluated for adequate knowledge and skills required to provide the expected care.

Previous studies demonstrated that the risk of development of PU in patients admitted to intensive care units, neurology, orthopedics, physical rehabilitation units is higher due to many factors , including immobility (Schoonhoven, Defloor &Grypdonck 2002; Panagiotopoulou, & Kerr 2002; Aydin & Karadag 2010). Based on this understanding, nurses in this study were selected from those working in neurology, orthopedic surgery, intensive care units, medical and surgical inpatients units. This is because of the high risk profile for PU which is common in these units, making it essential that nurses practising in these units be assessed for knowledge of assessment of the level of risk and practice of appropriate interventions to prevent PUs.

5.1. Demographic Characteristics of Survey Respondents and Research Questions

The participants in the survey aspect of the study were 446 nurses of which 421 (94.4%) were female and only 25(5.6%) were male gender. This may be attributed to the fact the nursing is a female-dominated profession. The educational category showed that 308 (69.1%) were registered nurses (RN), without university degrees, while 61(13.7%) were RNs with BNSc and

76 (17%) were RNs with degree in Health Education. Literature suggests that there is a correlation between educational level and the disposition to clinical decision making and critical thinking. Though the goal of this study was not to measure the respondents' clinical decision making skills, it should be emphasized that effective critical thinking skills and clinical decision making enhance provision of quality care. Therefore to achieve effective PU prevention, it behooves nurses to have effective clinical decision making skills, of which their level of education provides an advantage. Participants were at different levels in their career (Table 4.1.3) as indicated by their professional ranks and years of experience. Assessment of years of experience was necessary in order to determine participants' potential for clinical decision making. However, some authors argue that experience alone is not sufficient to enhance effective clinical decision making. On the other hand, Banning (2008), following a literature review of the models for clinical decision making of nurses, concluded that experiential knowledge in specific areas of practice resulted in improved clinical decision skills of nurses, thereby supporting the significant role of years of experience in facilitating decision making in clinical situations.

Research Question one: This sought to measure the baseline knowledge of PU preventive strategies among nurses in the survey group. Findings suggests that the level of knowledge required of nurses to effectively prevent PU was unsatisfactory, and supports the findings of a similar study in Alexandria (Enein & Zaghloul, 2011), which reported an overall mean score below 70% (N=122) and was concluded as being below the minimum acceptable level. Findings from literature affirms the link between knowledge and clinical decision making (Baker, 2000; Hagbaghery, Salsali & Ahmadi, 2004; Ayello, Zulkowski & Capezuti, 2010). It suggests therefore that without a satisfactory level of knowledge of PU preventive interventions among nurses, the best clinical decisions would not likely be taken in practice. The implication on patient outcome would therefore be better imagined than experienced. Suggestively, the low to moderate level of knowledge noted among survey subjects in this study may be attributed to inadequate content of PU prevention in curricula of nursing programmes as observed by Ayello et.al, (2010). It was however necessary to examine the baseline knowledge in order to plan educational intervention to fill identified gaps.

In many countries, several initiatives have been implemented in an effort to reduce PU rates. Such initiatives include comprehensive PU prevention programmes which focused on skin

assessment, documentation and education on evidence-based interventions. Appreciable successes have been documented (Ruppman & Cooper, 2006; Griffin, Catania et al, 2007; Courtney, Cooper, Horack, Klyber, & Schimmekpfenning, 2007; Chicano & Drolshagen, 2009; Hayden et al., 2009; Institute for Healthcare Improvement, 2009). Findings of this present study corroborate previous results (Pierper & Mott, 1995; Panagiotopoulou & Kerr, 2000) which showed that nurses' knowledge of PU preventive interventions were between low to moderate levels. However, it is worth mentioning that some of respondents in the survey group had correct knowledge perspective of some items on assessment and interventions to prevent PU. This may be attributed to the fact that some participants were previously exposed to continuing education on PU prevention, as findings indicated a perfect correlation between knowledge and previous exposure among the participants. Also to explain these findings is the principles of adult learning as propounded by Knowles (1990).

One of the basic tenets of adult learning is that learners possess a wide range of experiences and knowledge from previous education, which is usually brought to the fore in a new learning situation. Consequently, learning is connected with experiences, thus enhancing a better outcome. Within the context of this study, respondents were nurses with varied levels of clinical experience and education, which could have contributed to the correct perspective of some preventive interventions demonstrated by respondents in this study. Although respondents demonstrated good knowledge perspective in some aspects of PU prevention, clinical experience indicated inadequate application to practice. In consonance with this, Gunningberg, Lindholm, Carlsson, and Sjoden (2001) observed that limited application of knowledge is a common problem in clinical practice. The authors further noted that not all nursing staff were aware of or applied up-to-date protocols for PU prevention, suggesting that to achieve a positive patient outcome with regards to PU prevention, a good number of nurses should be well knowledgeable and be able to apply up-to-date protocols for PU prevention through exposure to current evidence-based practices. It should be noted that factors such as available resources, policies in institutions, and support may influence what nurse do in clinical practice .

Further on this issue (inadequate application of up-to-date protocols) in the late 2005, Turkish nurses were reported to be massaging bony prominences of at risk patients, as well as using ring/doughnut devices, even though these interventions had been outdated for over 20 years before the study (Anton, 2006) . It may be argued therefore that educational programme

can serve as an appropriate tool to determine deficit in knowledge and to fill such gaps. It is quite worrisome to note that currently in the hospitals where this study was conducted, nurses are still using massage of bony prominences for PU prevention almost 30 years after the intervention had been outdated. This finding was confirmed in a report from a descriptive evaluation of interventions used by nurses to prevent PU (Adejumo, 2010). Nurses in that study preferred to massage bony prominences of at risk individuals for as long as 30 minutes. To corroborate this result, 434 (97.3%) participants in the survey phase of this study marked the massage of bony prominences and 422 (94.6%) marked use of ring/doughnut devices as correct interventions to prevent PU. This suggests that respondents in these hospitals are not aware of practices which were no longer supported by best available evidence and therefore still hold on to tradition and myths. Therefore, this study should be seen as being quite timely and relevant for the moment.

An important component of professional nursing practice is the ability of the nurses to make evidence-based decisions in clinical practice (Hagbaghery, et. al. 2004) that will culminate into good patient outcome. Doing this requires that nurses avail themselves of current information, rather than implement obsolete interventions, particularly in the current dynamic and complex healthcare environment where quality of care is the buzzword.

The question to be answered therefore is: how can nurses provide adequate care when they are not abreast with current practices and changes in a very significant and basic aspect of patient care such as PU prevention? Skin care and indeed interventions to prevent PU are basic nursing activities and as such nurses may likely consider it elementary. The challenge here has to do with lack of protocol for evidence-based practices. This may explain why nurses often fall short in keeping abreast of recent changes and recommendations in this area.

Research Question Two: The question examined the relationship between knowledge of PU prevention and level of education of respondents in the survey. Findings indicated a weak correlation between level of education and score on PUKT. These findings suggest that despite levels of academic achievement, a focused programme in PU prevention is necessary for optimum knowledge. The result of the study in which the PUKT adapted for this research was initially developed (Pieper & Motts 1995), which involved 228 nurses from two American hospitals, the mean percentage of correct answers was identified at 71.7%. Knowledge levels were significantly higher among professionals who had attended some lecture or read some

article on the theme the year before. This suggest that despite the educational status of nurses, an exposure to PU focused education was necessary to achieve an optimum level of knowledge required for effective practice. The weak correlation obtained in this present study maybe attributed to the fact that higher education makes for better understanding of concepts. Further on this, the report of a study in Brazil involving nursing students from a public university using the same PUKT showed significant higher knowledge scores among students who participated in extracurricular activities or used the Internet to seek information about PU (Caliri, Miyazaki,. Pieper, 2003), thereby supporting the significant role of focused PU continuing education, despite academic status.

Research Question Three: The question was raised to examine the practices implemented to manage risk for PU development among nurses in the quasi experimental study. The findings supported the impetus for the conduct of an educational programme, as it indicated a serious gap in knowledge of evidence-based interventions (table 4.2.1). The use of numerical scale to objectively measure the risk of PU has been supported extensively in literature and are also included in all international guidelines for PU prevention. The goal of such assessment is to alert the nurse to each patient's predisposition to PU development, thereby enhancing individualized plan of care. But in a situation where a basic and first step towards PU prevention is not understood, let alone implemented, it brings to question the competence of the nursing team to effectively prevent PU among hospitalized patients. This may provide a possible explanation to the baseline findings for this study when the researcher conducted a preliminary PU prevalence and incidence audit on selected wards in the University College Hospital. The result indicated 11% prevalence (n=218) of PU. This findings corroborates previous facility-based prevalence and incidence studies (Oluwatosin et.al, 1998; Onche et.al, 2004), suggesting a reduction in maintaining competence in this important area of nursing care. This was also the opinion of Gunningberg, Lindhom, Carlsson, & Sjogen, (2001), who concluded that increased prevalence of PU among patients is an indicator of decreased competence in PU prevention among nursing staff.

The Irish nursing board (An Bord Altranais 2005) noted that professional competence connotes safe and effective professional practice, which goes beyond achievement of psychomotor skills. It implies therefore that competency encompasses a complex mix of attributes such as knowledge, skills, abilities and attitudes. Competency in PU prevention therefore requires

integration of knowledge, skills and positive attitudes to PU prevention and not just acquisition of intellectual knowledge. This study examined just two components of competency: knowledge and practice in PU prevention. It is suggested that future studies, should examine nurses' attitude to PU prevention.

Recommendations from some international guidelines such as those developed by National Pressure Ulcer Advisory Panel (NPUAP), European Pressure Ulcer Advisory Panel (EPUAP) and Wounds, Ostomy and Continence Nursing (WOCN) do not support the massaging of bony prominences of at-risk individuals. However, this practice was found to be persistent in the three hospitals where this study was conducted. The results also indicated that prior to this study, 302 (67.7%) had never attended a workshop on PU prevention since graduation from nursing school. Among those who claimed to have attended a PU workshop previously, 56.3% had that over 5yrs before the study. This is probably why many participants were still implementing interventions that were not supported by current research evidence. Other factors which may also influence what nurses implement in clinical practice include, basic knowledge from school, organizational obligations, opinion of experts such as medical consultants/ clinical specialists in the specific institutions. The researcher's experience suggest that nurses are sometimes found in situations where they can only implement interventions just as prescribed or within the limit of the available resources in the facilities, or again what is supported by experts in the specific area of practice. These are all results of absence of practice guidelines.

As far back as 1999 some authors (Buss, Inge, Halfens,Abu-Saad & Kok, 1999) opined that a formal or semi-formal workshop was a more effective and reliable way to diffuse new research information. Going by this, since a good number of nurses in this study were not exposed to a formal programme on PU prevention, the likelihood that they will be familiar with current information and changes in PU preventive practices is therefore called to question. As noted, 431 (96.6%) of the survey respondents indicated interest to attend a workshop on PU prevention, if invited, suggesting a strong indication of nurses' readiness to learn. This however is not in agreement with Forseth (2010) , who though reported that nurses lacked sufficient knowledge of evidence-based interventions for PU prevention, believed strongly that some factors such as travel cost, cost of the program, and having to take time off from facilities

which are generally understaffed may discourage nurses from participating in educational programmes.

The implication of this finding is that continuing professional education is key to continuously provide an update in practice. To the best of the researcher's knowledge, there had not been a formal focused continuing training workshop on PU prevention, before this study in the selected facilities. It is therefore suggested that this should be included in the continuing education curriculum of institutions for nurses. Literature suggests that sometimes the opportunity to implement what has been learnt is often fraught with difficulties within the clinical settings (Maben, Latter & Clark, 2006; Moore, 2010), ranging from organizational policies, and environmental factors such as lack of resources may place limitations on how care is provided.

Research Question four: The hindrances to PU prevention in clinical practice were examined, in order to determine from all sides of the paradigm: evidence, knowledge, opportunity and practice where problem can be. This is because one aspect cannot exert influence without due consideration of all other components. From the responses, inadequate manpower (poor staffing) was noted as the greatest impediment (table 4.2.4) to PU prevention. Evidence-based guidelines (NPUAP, EPUAP) recommend a two hourly repositioning of patients and at more frequent intervals for those at very high risk. While this recommendation makes rational and logical sense, the practical adherence may become a challenge if the ratio of nurse to patient at any given time does not match the dependency profile of the patients. It should be noted also that the nurse –patient ratio is a reflection of how well a hospital nursing care is meeting the needs of patients. As at the time when this study was conducted, it was observed that in the three hospitals, the nurse-patient ratios were found to be below the globally recommended standard of 1:4 in medical surgical wards. For instance in the intervention hospital I (LASUTH), the nurse patient ratio was 1:10, in intervention hospital II (UCH) , the ratio was 1: 9 and in the control hospital (OAUTHC), 1 : 11. This may undermine effective implementation of key PU preventive interventions such as repositioning. Though the staffing standards differ slightly between countries, on the average literature suggests that the minimum standard for effective and quality nursing care should be one nurse to four or five patients (1: 4 or 1:5) on medical surgical wards (Gerdtz & Nelson, 2007; McGillis Hall & Buh, 2009) . An adequate nurse: patient ratio is believed to increase job satisfaction, enhance job stability and reduce stress

among nursing staff (Gordon, Buchanan & Bretherton 2008). Conversely, a poor staffing situation reduces quality of healthcare provided to patients and compromises patient outcomes.

Across the intervention and control hospitals for this study the most significant barrier was inadequate manpower to execute the timed turning schedule. Akin to this was a report of barriers to PU prevention in an Intensive Care Unit (ICU) (Strand & Lindgren 2010). Authors noted that 57.8% of respondents reported lack of time among staff in the ICU to implement preventive interventions. Also providing further evidence to these findings is the report among Irish nurses (Moore and Price, 2004), of lack of time and staff to maintain timed turning schedules as major barriers. These reports go on to corroborate the findings of this present study. The importance of adequate staffing for the purpose of effective PU prevention cannot be overemphasized. A situation whereby three nurses provide care for 28 very ill, mobility compromised patients, as may happen in some facilities where this study took place, increase the patients' predisposition to PU development, suggesting that overworked and stressed nurses who are expected to provide high quality care would more likely experience burn out. This may eventually affect their positive attitude to PU prevention, and consequently may perpetuate the cycle of increased PU prevalence in the hospitals.

The unpleasant effect of poor staffing in PU prevention becomes more overwhelming in bariatric care because obese and overweight individuals are more prone to PU and impairment in skin integrity. Rush (2009) observed that lack of training, poor staffing and unsafe handling techniques contribute to the increased risk of tissue damage among bariatric populations. While nurses need to preserve the skin integrity of such group of patients, there is need to avoid injury to themselves, therefore the need for institutions to pay attention to the issue of staffing in the phase of growing increase problem of obesity with its accompanying health conditions, many of which results in immobility and inactivity. The possible suggestion could be to encourage the integration of the family into care. Evidence in literature supports the integration of family education in PU prevention because when family members' understand the risk factors for PU, they can also enhance early identification and report. It should be noted also that a reduction in PU prevalence goes beyond providing education and training to include provision of resources in the hospitals, in order to ensure nurses are able to practise what they have learnt. This brings to the fore the significant role of the organizational culture. Management of institutions need to understand and foster an environment in which best practices in PU

prevention becomes a reality. Respondents in this study also noted inadequate linen on the wards as the next on the hierarchy of hindrances ($\bar{x}$=4.0±1.1), followed closely by lack of pressure redistribution appliances. All these support the need for organizational support towards provision of resources. However, such changes may not come with ease with particular reference to PU prevention, as it involves multiple, simultaneous modifications to work flow and decision making. This is suggested for future research.

Other factors which gained prominence on the list of hindrances as noted by the respondents were poor access to literature and inadequate knowledge of evidence-based practices . A quality improvement project which examined the barriers to implementation of PU prevention programmes (Jankowski & Nadzam, 2011) across four hospitals reported varying barriers ranging from limitations in staff education and training. The study reported that PU preventive education was focused on nurses, equipment and supplies issues, and information for use of equipment was limited to nurses rather than a team approach which involves all categories of staff. The study reported poor involvement of physicians. It was suggested that a team approach was necessary for successful implementation of PU prevention programmes.

Also within the ethical framework, the four principles of autonomy, justice, non-maleficence and beneficence maybe used to establish a prima-facie obligation for PU prevention, thereby providing opportunity for litigation. Beauchamp and Childress (2001) cited in Clarkson (2007) described a prima facie obligation as one 'that must be fulfilled unless it conflicts on a particular occasion with an equal or stronger obligation'. Autonomy in PU prevention implies that the patient understands all relevant treatment and consequences of not consenting to treatment and the right to take decision based on adequate information. The prima facie of non-maleficence means doing no harm to the patient. Both the nurse and the institution owe the patient a duty to care and needs to act in accordance with this duty at all times. Negligence maybe said to occur when this duty is violated in anyway. For example, when a patient develops a PU as a result of inadequate staffing to facilitate implementation of appropriate preventive interventions, it may be interpreted as negligence on the part of institution. This study did not explore the facilities' PU prevention policies and attitudes of staff towards PU prevention which may undermine the required change. This is suggested to be examined in the future. Discussions on research questions five to nine are provided under discussion on hypotheses.

5.2 Effect of Intervention on Practice.

The clinical outcome of the effect of the educational programme was examined using the point prevalence of PU among patients in the selected wards pre and 3months post intervention in both the control and the experimental hospitals . The goal was to determine the effect of educational programme on practice and consequently on patient outcome in the experimental hospitals. This was the second most important variable in this study. It is important to note that to the best of the researcher's knowledge, there were no PU protocols or nursing documentation records for PU prevention in these hospitals prior to this study. To facilitate the assessment of practice, the researcher provided the resources and documentation record required for the study. This was done following the approval by the Nursing Department of the institutions.

Most interventions were easily diffused and carried out within the selected wards in the experimental hospitals as the mean rank for practice increased only in the experimental group from baseline 97.00 to 105.00 at 12 weeks posttest. This means that in the selected wards, PU prevention was carried out as expected, with detailed documentation using the record provided by the researcher. Specific interventions which were easily diffused among nurses in the experimental hospitals included conducting an initial risk assessment on every patient who was admitted during the period of study using the Braden scale, as it was taught during the workshop. A reassessment was also conducted after 48 hours. These were not the usual practices in these hospitals . Other interventions which were not usual practices but participants were able to implement were maintaining head of bed elevation at 30 degree, repositioning patients based on individualized turning schedule, consistently revising the plan of care based on patient's current needs, and periodically assessing the effectiveness of the foam support surfaces by testing for ' bottoming out'.

The researcher observed that prior to the study, every patient considered to be at risk was placed on a 2 hourly repositioning schedule that was not judiciously followed, irrespective of the level of risk. Since Braden scale or any other risk- predicting tool was not in use, it was difficult to measure objectively the level of risk which should normally provide a guide to the frequency of repositioning for each individual.

In attempt to determine the effect of the educational programme on patients' outcome, two point-prevalence of PU was taken in the selected wards for the practice. The first one was taken before the practice began and the second was taken at the end of three months (tables

4.2.6, 4.2.7, & 4.2.8). Braden and Blanchard (2007) explained that to accurately measure the effectiveness of a PU prevention programme, a baseline prevalence data on PU is necessary . According to the authors, the purpose of a point- prevalence study is to determine the percentage of patients with PU in the facility at one point in time, (usually one day), which should be conducted as close to the time of start of study as possible. This should be repeated immediately after the study and at specific intervals. During this study in the UCH Ibadan, a minimal difference in the point-prevalence was observed before and after the 12 weeks practice. In LASUTH, a significant impact was also noted. At the beginning of the study, the calculated point-prevalence was 0.21 but by the end of 12 weeks it dropped to 0.1, indicating a positive impact. Comparatively in the control hospital where no treatment was given, it was observed that a slight increase in the point-prevalence was recorded; suggesting that the reduction obtained in the experimental hospital was possibly associated with the educational intervention and hands-on practice which the participants were exposed to. During the period under investigation, admission and discharge of patients in and out the selected wards were ongoing. Therefore patients with different profiles in terms of age and medical diagnosis may have influenced the results obtained. For example, there are evidences of association between advanced age and PU development, which indicates that PU is a sign of overall fragility **(**Leijon, Berg, Terstappen. 2013) and this was not accounted for in the study, therefore maybe considered a limitation in this study. The point prevalence study provides a measurement of PU at a particular point in time and suggest an improvement in PU preventive strategies during the period under investigation.

5.3 Discussion of Hypotheses

The phase II of the study utilized a quasi -experimental pretest and posttest design. Five (5) null hypotheses were formulated and tested . The discussion is presented below.

Hypothesis I (Ho1): The hypothesis stated that there is no significant effect of educational intervention on nurses' knowledge of PU preventive strategies between experimental and control groups. The results showed that the mean score increased significantly from baseline to immediately post intervention in the intervention group. Respondents' increased knowledge post intervention was also maintained till 3 months posttest as indicated by the mean score (42.7±4.0, $p<0.05$) among the intervention group. Therefore the null hypothesis was rejected, implying that

the intervention had significant effect on respondents' knowledge of PU preventive interventions.

This finding is however expected and further confirms those of Panagiotopoulou and Kerr (2002), Sinclair et. al, (2004) and Gunningberg (2004) who also assessed nurses' knowledge for PU prevention prior to an educational intervention. The studies reported a moderate level of knowledge among nurses in those countries. In this study, the pretest scores may be interpreted as a reflection of the nurses' actual knowledge level on PU prevention as they were not expecting the pretest. It is possible that the pretest might have alerted the participants to their knowledge deficits and therefore prompted them to focus on relevant information during the intervention sessions, which contributed to the increased scores at posttest. It may be deduced from these findings that intermittent educational programme can be a helpful tool in improving nurses' knowledge of PU prevention.

In order to take cognizance of the control group performance and to compare the mean difference between intervention group and control group pre and post intervention, a paired t-test was conducted. Findings indicated the mean difference in knowledge score at pretest and immediate posttest among the intervention group, suggesting a significant increase in knowledge from baseline to immediate post intervention; therefore, the Ho1 was rejected. Similarly, there was a significant increase in mean score from immediate posttest to 3 months posttest in the intervention group. Therefore, the Ho1 was rejected. It was observed that the increased mean difference in knowledge score from baseline to immediate posttest in intervention group was significantly higher than that observed in the control group. This trend indicated that the intervention was effective in improving respondents' knowledge immediately. It should also be recognized that respondents in the study were adult learners , with varied previous experiences and learning which were also brought to the fore. This possibly could have contributed to the sustained increased knowledge as well as that observed among respondents in the control group. The increased in knowledge score observed among participants in the control group may have been due to possible exposure to similar programs during the period under study, without the knowledge of the researcher. The researcher did not have control over other programs that could take place in the institutions and several programs and workshops can occur concurrently. This was not however assessed post intervention. In addition, many nurses are

involved in open distance learning programs in Nigeria, which can also expose participants to lectures on PU prevention, and therefore may contribute to the findings in the control group.

Hypothesis 2 (Ho2): Hypothesis two (2) predicted a no significant effect of selected demographic variables (years of experience, professional cadre, educational level previous exposure to PU lecture) on posttest scores of nurses in the experimental and control groups. One way analysis of variance (ANOVA) was used to compare independent effect of each demographic variable on the posttest score of respondents. It was predicted that nurses' years of experience in clinical practice will not determine their score on the PUKT. Findings indicated that the effect of years of experience on posttest score in both experimental and control groups was not significant therefore, the null hypothesis was not rejected. This means that the number of years of experience did not determine the score on PUKT. Pancorbo-Hildago et.al (2007) reported that the level of knowledge for PU prevention among nurses with higher years of experience decreased with time. This could have been due to lack of continuing update in knowledge. The Pancorbo-Hildago et.al (2007) study sought to determine the Spanish nurses' knowledge of PU prevention and treatment and the implementation in clinical practice, as well as educational and professional barriers to practice. It follows that for knowledge to be retained for a long time, regular update is necessary irrespective of the years of clinical experience.

In the Netherlands, Hulsenboom, Bours, & Halfens (2007) compared the knowledge of PU preventive interventions between nurses working in hospitals which audit PU incidences and those which do not. The possible assumption is that experience in PU monitoring will enhance level of knowledge in this aspect of practice, given the consciousness of PU rates in the facility. Authors concluded on the contrary and reported that working in hospitals that monitor PU , does not culminate into a better knowledge about PU preventive interventions. This finding is however a deviation from a possible assumption that years of working experience in a hospital where PU incidences is monitored will influence level of knowledge of preventive interventions, suggesting that a change in knowledge requires a conscious effort towards a focused programme to provide update in this area, as this cannot be taken for granted. Evidence from literature shows that there are some countries where guidelines for prevention are available yet, PU prevalence was still a concern. For example, a report of a systematic review cited in Catania, James and Moran (2007), showed that physicians and nurses reported a feeling

of lack of education regarding PU management which was then concluded that guidelines were not reaching the intended audience. While education is a significant factor in improving practice, it is important to note that the success or otherwise of any intervention depends largely on the degree to which the management of an organization and the staff members who will provide the care have made PU prevention a priority. It follows therefore that a positive attitude towards PU prevention should be promoted since attitude is important in influencing behaviour.

To further provide evidence which supports that there is no relationship between experience and knowledge of PU preventive interventions, Gupta, Loong, and Leong (2012) conducted a comparative analysis between nurses and rehabilitation registrars working in two spinal units. Findings showed that rehabilitation registrars scored higher in preventive questions, which according to the authors was a reflection of academic knowledge rather than experience. It was noted specifically among the nurses that there was a difference in management knowledge which was attributed to specific work area rather than years of experience in general nursing practice. The lessons learnt from this result are that learning in specific clinical situations should be emphasized irrespective of individual practitioners' years of nursing experience, using problem based approach. Additionally, nurses who have acquired additional specialty as clinical nurse specialist in tissue viability should be introduced into the care environment. Their presence (tissue viability nurses) will facilitate implementation of best-practice through education of professional colleagues on advances in maintaining skin integrity.

With regards to the effect of professional cadre on posttest score in both experimental and control groups, the findings also indicated a no statistical significance (p=.058;>.05), suggesting that professional cadre just like years of experience did not determine the score at posttest. Similar explanations can be proffered here, because professional cadre in Nursing (presently in Nigeria), is determined more on years of experience, rather than educational qualification. The effect of previous exposure to PU lecture on posttest score also indicated a significant no statistical difference, implying that previous exposure to PU lecture did not independently determine the score at posttest.

The effect of educational level on posttest score in both experimental and control groups was also tested. A no statistical significant difference was noted (p=.684; >.05), implying that level of education did not determine the score at posttest. This appears like a paradox because among the survey respondents in this study, research question two (2) assessed the association

between knowledge of PU preventive intervention and level of education of nurses in the survey group. The findings indicated a positive although, weak correlation (table 4.1.10a). This suggests that as respondents' educational level improved, there was likelihood that their knowledge score of PU prevention would be better. It may be deduced that higher educational level may improve understanding of PU prevention with regular updates through focused programmes. Similarly, Piepier and Motts (1995) and Flanagan (2008) supported regular PU educational updates and the provision of 'top-up' educational activities for nurses who have previously attended an educational programme. According to Flanagan (2008), frequent and repeated exposure to education is required to top-up knowledge base of nurses, in order to facilitate clinical application and effective practice. Furthermore, Smith and Waugh (2009) found that nurses who had previously read a book or an article on PU obtained higher test scores on PUKT than those who did not. This also provides credence to the application of adult learning theory to this study. One of the major tenets of the adult learning theory (Knowles, 1990) is that learning needs to be reinforced, as retained knowledge decreases overtime. Based on this principle, the participants in the quasi-experimental part of this study were followed up for 12 weeks on the ward, and during this period reinforcement was done at clinical teaching.

To further buttress the possibility of better understanding based on educational level, Sinclair et.al (2004) compared level of knowledge of PU prevention using the same PUKT instrument between two different categories of nurses; Registered Nurses (RN) and Licensed practised Nurses (LPN). The RNs are of higher educational level than the LPNs. As expected, the authors reported a significant group difference whereby the RNs scored higher than the LPNs.

In another context with the same PUKT among Greek nurses to compare the posttest scores of BSN with that obtained by the nurse auxiliaries (Miyazaki, Caliri & Santos, (2010). Similar findings were reported. Nurses with BSN obtained higher scores than the nurse auxillary. This suggests that nurses with higher education were possibly exposed to reading related articles which could have provided the necessary information. This goes on to support the adult learning principles (Knowles 1990), which presents a view point that adult learners are self directed. While the culture of reading needs to be encouraged among nurse practitioners, there is an urgent need for review of the content of curricular of all nursing programmes, both at baccalaureate and diploma levels. This is to ensure that adequate content for PU prevention is emphasized, to

ensure the maintenance of skin integrity of patients. Furthermore, a mere knowledge may not be sufficient to culminate into change in practice, therefore, an eclectic approach requiring application of different methods may be necessary.

Hypothesis 3 (Ho3) : Hypothesis three (3) stated that there is no significant interaction effect of treatment, years of experience, professional cadre and previous PU lecture on posttest score in experimental and control groups. The interaction effect of each variable with treatment was determined statistically. With regards to years of experience, findings were not significant (p=.270>.05). Therefore, the decision not to reject the null hypothesis was made. This is to say that years of experience of the respondents did not independently determine the posttest score, but also the treatment. Tweed and Tweed (2008) found no difference in knowledge level between nurses with different levels of experience, qualification and seniority. Much earlier studies (Pierper & Mott 1995; Pierper & Mattern, 1997; Mockridge & Anthony 1997) reported similar findings. The findings in this present study may be explained further using the experiential learning model proposed by Kolb (1984). The theory hypothesized that concrete experience allows for reflections which involve perceiving and processing, resulting in abstract conceptualization and active experimentation. It could be inferred therefore that respondents in this study being adult learners had the capacity to think and relate concepts (abstract conceptualization), which could have possibly contributed to the high scores obtained at posttest. There was therefore a positive interaction of the treatment with years of experience among study participants, suggesting that nurses who have worked for long periods on the wards should be provided with opportunities for continuing education. to enhance their potential to learn.

The interaction effect of treatment with professional cadre was also not significant (p=.175; >.05). This implies that the treatment contributed to the posttest scores of respondents, rather than just the level of professional cadre. Nurses at higher professional cadre require a top-up education to be able to practise optimally. Nurses who have worked for years and have attended high professional cadre via promotion should be encouraged to participate actively in continuing education programmes. To provide explanation to this, Sobral (2000), Grant, Kinnersley, and Metcalf et.al (2006) stated that for professionals to make meanings out of their own experiences and apply new knowledge, reflection is an essential skill. Reflection is a

metacognitive process that creates better understanding of both the self and the situation, in order that the understanding may inform future actions (Saunders, 2009). This has been found to be a major component of life-long learning. Because reflection is believed to improve professional competence, it may be concluded that it was easier for respondents at higher professional cadre, which more often than not goes with years of experience, to have reflected on their practices. When exposed to treatment, it positively influenced their scores at posttest.

Further explanation could be drawn from the cycle of experiential learning as proffered by Kolb (1984). Accordingly, in a learning situation, experience is not a stand-alone factor, but it must be integrated into an existing knowledge structure to become new and expanded knowledge. This process requires the skill of reflection and it is described as a metacognitive process for a higher level of personal learning. Some practitioners may find it difficult and uncomfortable; but be that as it may, it is important not to dismiss the significance of experience. However, a mix of high educational level (university level) with experience is essential for abstract conceptualizations and better application of new knowledge.

The interaction effect of treatment with previous exposure to PU lecture was statistically significant ($p=.030$; $<.05$). Therefore, the decision to fail to reject the null hypothesis was taken. This means that there is a significant interaction effect of treatment with previous exposure to PU lectures.

Finally on hypothesis 3, the interaction effect of treatment with educational level was not statistically significant ($p=.930$; $>.50$). This means that the treatment received by respondent interacted positively with participants' educational level to influence the score obtained on the PUKT at posttest. It suggests therefore that higher educational level provided a better understanding of the content of PU education. A similar explanation was proffered by Gupta, et.al (2012) when comparing the knowledge of PU prevention and management between nursing staff and rehabilitation registrars which was cited earlier. The authors attributed the higher scores obtained by registrars to higher academic knowledge rather than long years of experience. This interaction suggests that educational level may improve outcome of PU preventive education because it may likely provide nurses with a theoretical foundation upon which knowledge would be built. It may also be inferred that since participants in both groups (experimental and control) are professionals, their ability to apply reflective learning as individuals may have contributed to their scores at posttest. Flanaga (2008) opines that reflective learning is associated with a deeper

learning style and provides better personal insight. Personal insight is defined as a purposeful thinking that is provoked by unease in the learners, when they recognize that their understanding is incomplete. It therefore suggests that the scores obtained at posttest was a function of the treatment which the nurses in the experimental group were exposed to, and that higher level of education (university) contributed to the difference observed.

Hypothesis 4 (Ho4): This hypothesis states that there is no significant difference in the immediate posttest mean score and the 3 months posttest score of nurses in the experimental and control groups. This hypothesis sought to establish a within group difference in the scores obtained by respondents at immediate posttest and at 3 months. In order to compare the mean scores obtained at immediate posttest and 3 months posttest, a paired sample t-test was conducted (table 4.2.15.). Findings indicated a marked increase in the mean scores between immediate posttest and 3 months post intervention. A similar increase was observed in the control group 3 months posttest. The result shows a significant difference in scores obtained ($p<0.05$) in both intervention and control groups, therefore the decision to reject hypothesis 4 was taken. This means that there was a significant difference between scores obtained at pretest and at 3 months posttest, suggesting that knowledge was retained for 3 months post intervention. The normal assumption is that the scores at immediate posttest should be higher than that obtained by respondents after 3 months. Most similar studies (Pieper & Mott, 1995; Sinclair et.al 2004; Miyazaki, 2010) recorded a reduction in scores at three months posttest as it is believed that retention of facts declines with time. The reverse was observed in this study. Just as Moraga and Rahn (2012) noted that results of experimental studies are not always expected to be exactly as stated in literature, and therefore should be carefully interpreted in the light of the specific experiment. Judging from this understanding, participants' knowledge score at 3 months increased rather than declined which is not what is expected in literature. Within the confines of this study, this phenomenon can be explained using the principles of Cooperative learning (Johnson, Johnson, & Smith, 1998). Cooperative learning is defined as the instructional use of small groups so that students work together to maximize their own and each other's learning. This has been found to provide students with an environment of social interdependence or mutual dependence rather than competition. It is proposed that such learning strategy promotes deep understanding of the subject matter and enhances knowledge retention in students. It also

favors higher individual achievement than the competitive and individualistic approaches, therefore promotes a positive attitude towards the subject matter.

In this study, participants were divided into three groups after the intervention, for the purpose of hands-on experience on the three selected wards. Each group worked on three different wards where the researcher reinforced the teaching at the bedside. It is believed that this small grouping facilitated cooperative learning among participants and possibly improved their attitude towards PU prevention. In the long run, it resulted in better knowledge retention and the higher score that was recorded after 3 months. It is possible that cooperative learning strategy stimulated a positive attitude towards PU prevention among the respondents, which led to a conscious effort towards quest for more information on PU prevention, thereby consolidating what was taught during the intervention programme. Again, going by Kolb's-Experiential Learning Theory (K-ELT), it is noted that learning takes place through four modes which require different types of abilities:

1. Concrete experience, which is described as ' feeling'
2. Reflective observation '' Watching''
3. Abstract conceptualization ''Thinking''
4. Active experimentation ''Doing''.

Sowunmi (2007) opines that learners who employ concrete experience-based approach to learning tend to relate more with peers rather than being autonomous. With reflective, observation learners watch and listen attentively, and tend to apply reflective approach to learning. The third group of learners are those with the ability for abstract formulations who are able to relate one concept with another. Sowunmi (2007) again explained that within this category, learners learn best through theories, case studies and talking to experts. Finally, active experimentation implies learning by doing. Such learners always want to know what is new about a practice or phenomenon, as such they learn more through discussion, projects and home work. In this study, the participants were a mix of learners in the experimental group, some of whom were really involved in the study. Since PU prevention is a basic component of nursing training, participants were wondering what new information the researcher was bringing to them, which possibly made the active experimenters among them to pay rapt attention. The researcher also observed that most participants were quite enthusiastic about the study which could have led to a more independent reading. Secondly, during the 12 weeks post intervention period when

practice was assessed, application of interventions in clinical practice brought a better understanding and could have been responsible for higher scores at 3 months. At such visits, reinforcement of facts was done.

Another perspective from which this phenomenon of higher score at 3 months posttest can be explained, is with the concept of reflection-on-action. Fitzgerald (1994) described the process of reflection-on- action as a retrospective contemplation of practice undertaken in order to uncover the knowledge used in practical situations, by analyzing and interpreting the information recalled. This definition implies that reflection-on-action is a process of turning information into knowledge. In simpler terms, it is a process of conducting a mental postmortem. Several years ago, Boyd and Fales (1983) described the concept of reflection-on-practice as a process of creating and clarifying the meanings of experiences in terms of self, in relation to both self and world. The outcome of this process is a changed conceptual perspective. The authors focused on the effect of reflection on self development which implies that reflection does not only add to knowledge but challenges the concepts and theories held previously. As a result, rather than see more, one tends to see differently. Within this context, it can be argued that after the three months follow-up period, participants in this study reflected on the practice and were able to turn the information they received during the training workshop into knowledge, which resulted in conceptual formations. At the end of the period, they had a better understanding which is believed to have contributed to the higher scores obtained at three months post test.

Hypothesis 5 (Ho5): In attempt to determine the relationship between knowledge and practice, hypothesis five was drawn. The hypothesis predicted that there is no significant difference in the nursing practice before and after intervention across experimental and control settings. The mean rank of practice using the Mann Whitney U test between intervention and control groups showed that at baseline the mean rank was similar (97.00) in both groups, suggesting similar practice for PU prevention prior to the intervention. However at posttest, there was a marked increase in the mean rank score for practice only in the intervention group (105.00), suggesting a better practice for PU prevention. However, the mean rank for practice in the control group reduced at 3 months to 87.5 (table 4.2.16).

Literature is consistent on the fact that nurses' knowledge in PU prevention is hardly reflected in clinical practice. Tweed and Tweed (2008) in a study of knowledge of PU prevention among critical care nurses concluded that though increase in knowledge was observed among the cohort of nurses in their study, this was not reflected in practice. The authors noted that an acceptable performance requires both knowledge and the ability to translate knowledge into practice. Participants in this study were followed up for 12 weeks to evaluate implementation of knowledge gained during the workshop sessions into clinical practice. This was to enable the researcher effectively assess the translation of knowledge into practice and to be able to measure the practice component of the study. Findings indicated a positive correlation of knowledge with practice. Participants in the experimental hospitals were able to apply knowledge gained during the educational session into clinical practice during the period of study. This could have been possible because the required consumables were made available by the researcher, which sometimes may not be available in the hospital.

Multiple studies have examined the impact of structured education on PU prevention on clinical outcome. Hopkins, Hanlon, Yauk et.al (2000) implemented a multi component intervention which was facilitated by educational activities for nurses. The results indicated positive clinical outcomes in terms of improvement in PU prevalence rates. In another study, Sinclair et al (2004), on the effect of an evidence-based education programme for PU prevention reported increased knowledge of nurses who participated in the study. Although evidence in this area is sparse, it appears that a nurse-focused comprehensive education has the potential to improve practice and patient outcome. Furthermore, Padula, Osborne and Williams (2008) in a pre and post intervention study, concluded that although the PU rates post intervention did not change, there was an obvious improvements in nursing documentation of risk assessment and preventive strategies. The study also resulted in modification of nursing documentation records to facilitate accurate and consistent charting. Similar result was obtained in one of the experimental settings for this present study; the University college hospital, where the Nursing division following the study commenced a process of integrating the PU risk assessment into the nursing record, in order to facilitate documentation of the nursing risk assessment for PU. This is an indication that one of the goals of the project was accomplished. It is hoped that the process would be sustained and can spread to other hospitals within the scope of this study.

One of the theories which provide the basis for the conceptual framework for this study is Rogers' theory of innovation diffusion. The theory postulates that diffusion of an idea, innovation or practice within a social system is a function of the characteristics of the innovation itself. These characteristics include the relative advantage, compatibility, complexity, trial-ability, and observability of the idea. The relative *advantage* is the degree to which an innovation is perceived as better than the idea it supersedes, such as effectiveness. *Compatibility* is the degree to which an innovation is perceived as being consistent with the existing values, norms, work, and needs of the users (Rogers, 2003). The *complexity* of the innovation is the relative simplicity of the innovation. The *trial-ability* of an intervention refers to the degree to which an innovation may be experimented with on a limited basis (Rogers, 2003). *Observability* refers to the degree to which results of the innovation are visible to others (Rogers, 2003). Innovations perceived as having greater relative advantage, compatibility with work and needs of users, less complex, and that can be trialed and observed are adopted more rapidly than otherwise stated. Based on the foregoing explanations, it can be said that as an aftermath of the study, the Nursing Division has found the idea of integrating risk assessment for PU in the nursing documentation record to meet the characteristics described in Rogers (2003). It is hoped that the idea will be diffused throughout the social system.

Practices may be different in hospitals depending on the institutional values, beliefs and philosophies of each hospital. Philosophies provide a guide for the vision and mission of each institution and also serve as a roadmap towards the achievement of such visions. For example, where quality improvement is a mission, the prevention of PU would be accorded attention and it should therefore be expected that nurses in such hospitals would be provided with the required resources for better practice. Based on this standpoint, research question three compared the preventive practices for PU across the three hospitals in the quasi-experimental study. Findings indicate that participants in Lagos (Intervention Group I) tend to be more familiar and used evidenced based interventions than their counterparts in the other two settings. (Table 4.2.3). This is quite surprising because in the same hospital (Lagos), respondents also indicated that nurses' clinical judgment was more often used to determine level of risk. It is possible that the respondents were just marking the options as they deemed right without actually expressing the true picture of the situation. The implication is that some of the findings may not be a true reflection of their practices.

At the end of the 3 months study, the participants in the control group were exposed to the same educational intervention programme for ethical reasons. The evidence-based protocol was distributed to all participants through the continuing education department. Participants who attended that workshop were given copies of the evidence-based protocol as a pocket guide for PU prevention.

5.4. Implications of Findings to Nursing Education and Medical Surgical Nursing Practice

The findings of this study have the following implications.

1. **Implication for PU continuing and pre-service education:** The effects of pressure ulcer on patient cut across all aspects of patient's functioning including economic resources, as its occurrence increases length of hospital stay and cost of treatment. Nurses play significant role in PU prevention, therefore, an acceptable knowledge level towards implementing evidence-based interventions is crucial and significant. A periodic update on PU prevention is required through a continuing educational programme for practising nurses. Furthermore, findings indicated that many nurses were not previously exposed to PU prevention workshops, and so , did not have opportunity to be updated on the changes in practice. It should be emphasized that maintaining skin integrity is a basic responsibility of the clinical nurse, and this is also part of the basic nursing curriculum. However, literature confirms that this important aspect has not received the required attention in the various curricular. This makes a top-up education very necessary for practising nurses.

2. **Review of nursing documentation record to include PU risk assessment data**: Findings from this study indicated that risk assessment for PU was not included as part of nursing comprehensive record. This is a serious gap in the phase of current quest for quality care. The saying 'what is not documented is considered not done' is still very relevant. Nursing departments in the various hospitals should include as a matter of urgency a risk assessment record for early detection of patients at-risk for PU development. This will facilitate early implementation of preventive interventions. Institutional support is also necessary to enhance provision of stationeries for this purpose. This calls for lobbying of management of institutions to secure support. Nursing division can conduct a facility-based prevalence survey to provide

evidence to support their request. This hopefully will secure support towards the provision of required resources for PU prevention.

3. **Practice as informed by evidence-based standards**: The result of comparison of practices across the different hospitals indicated that practices for PU prevention were different. Since there are no specified practice guidelines in the institutions, individual nurses were found implementing what they judged individually as good. This suggests an urgent need for the development of practice guidelines; both at facility and at national levels to check inconsistency in practices. It behooves the nursing organizational bodies such as National Association of Nigerian Nurses and Midwives (NANNM) to come together and form committees towards the development of practice guidelines in order to promote standard of care across hospitals in the country. This is what is obtained in other countries. Currently practices are based more on available evidence from rigorous scientific research. Nurse practitioners and clinicians are therefore enjoined to keep abreast with changes and development in their specific areas of practice. This is the only way that provision of quality care to patients can be achieved.

4. Implication for Adequate staffing: Findings also revealed that acute shortage of staff compromised nurses' effort at implementing PU preventive interventions such as repositioning of patients at-risk. It is important that Nursing regulatory bodies: Nursing and Midwifery Council (NMCN) and National Association of Nigerian Nurses and Midwives (NANNM) insist on the employers' compliance with the minimum nurse: patient ratio, to allow for quality care. Situations where one or two nurses care for very ill patients on a 26- bedded ward does not allow for efficient care. Part of what influences employees' attitude to work is burn-out syndrome. Therefore employers of nurses need to take the poor staffing situation seriously. No one single clinician can do it all; therefore, there is need to improve the staffing situation in hospitals to enhance positive attitude and prevent burn-out syndrome from overwork.

5. **Implication for Improved educational level for nurses:** Findings demonstrated a positive correlation of educational level and scores obtained at posttest. This implies that nurses with higher educational level performed better. It could be suggested that higher education for nurses should no longer be handled with levity. Therefore, practising nurses should be encouraged to

improve academically, as this will enhance their clinical decision making skills which can translate into better practice. Higher educational level will also enhance individual nurse's self esteem and a better interpersonal relationship in healthcare environment.

6. Implication for review of Curricular of nursing Programs: An important implication of the findings to nursing education is the urgent need to give adequate attention to PU prevention in the various curricular for nursing programs. This content needs to be constantly revised, in order to take cognizance of developments in this important aspect of care. Every nurse must be well informed on effective interventions to maintain skin integrity of patients.

7. Implication for Nursing Specialization in skin care: Findings suggested the need for more nurses in skin care specialty, who can provide leadership for other nurses with regard to skin assessment and recommendation of appropriate resources for skin care. Such nurse specialists may facilitate partnership with wound care agencies for consumables to facilitate skin care. The materials for skin care such as barrier creams and sprays (Cavilon 3M) a dimethicone –based cream, rest-on foams and acrylic dressings used in this study were obtained through support from 3M- a wound care agency. This, to a very large extent contributed to the result obtained at the end of the study; because materials that were discussed during the workshop session were available for use during practice. In most hospitals, nurses make recommendations for resources required for nursing care to management, therefore availability of specialist nurses in skin care will enhance appropriate recommendations and suggestions to management towards the resources required for effective PU prevention. Finally, this study is not an end in itself but has also added to the volume of evidence in this important aspect of care.

CHAPTER SIX

SUMMARY AND CONCLUSION

6.1. Summary of Findings

Pressure ulcer is a preventable problem with nurses at the forefront of care, acting within the framework of knowledge of evidence- based practice. However, knowledge sometimes does not necessarily translate to practice when environment is not supportive. This study set out to measure the knowledge and practice of interventions to prevent PU among nurses, utilizing pretest posttest quasi-experimental design. To provide a baseline upon which to build the study, a cross sectional survey was conducted of nurses knowledge of interventions to prevent PU. The survey was conducted among nurses in three selected teaching hospitals, LASUTH, UCH and OAUTHC. A total of 446 nurses participated in the survey of which 55.2% were from UCH, 23.8% from OAUTHC and 21.1% were drawn from LASUTH. Only 5.6 percent were male nurses. Participants were at different levels of their professional cadre with varied years of experience in direct patient care. Educationally, 69.1% were diploma qualified nurses while 13.7% were nurses with BNSc degrees.

Most of the respondents (67.7%) had not been exposed to a PU prevention workshop since graduation for nursing programme. Among those who had such experience (32.3%) in the past, 56.3% claimed that it took place between 1 and 5years prior to this study. However, 96.6% indicated interest to attend a PU workshop if such an invitation was extended to them. This suggested a longing for knowledge acquisition in this area of care. The findings from the survey indicated that nurses had some basic knowledge of PU prevention, as 38.6% scored over 70% on the pressure ulcer knowledge test (PUKT). However, 37% obtained scores below 50% . The survey revealed a knowledge deficit in some areas of practice which made the educational intervention very necessary.

The second phase of the study was a quasi-experimental, pretest-posttest design . It involved 193 respondents from purposively selected wards in the three teaching hospitals: neurological, orthopedics and medical units were recruited. Participants received a 5-day Educational Intervention Programme (EIP) of five modules , which focused on PU risk assessment and preventive interventions with hands-on training. Knowledge of PU prevention

strategies was evaluated at three levels: baseline, immediate post-EIP, and 3-month post-EIP using a standardised Pressure Ulcer Knowledge Test (PUKT). Practice was assessed using a validated observational checklist (Risk-based Prevention Intervention Checklist) at baseline and 3-months post-EIP. During the 3-month period, consumables for skin care and prevention of friction were also provided for use on skin of patients at risk for PU in the intervention group. Nurses in the control group were provided with consumables to carry out the routine practice which they had been doing previously.

Findings from the study showed that the mean knowledge scores increased significantly among IG from 32.5 ±4.2 at baseline to 40.7 ±3.4 ($p<0.05$) at immediate post- EIP while in the control group it increased from 30.8± 5.0 to 31.2 ±5.2. The baseline scores in both IG and CG were slightly different, which suggested that there were at the same level of knowledge, having gone through similar curriculum of nursing programmes. At 3-month post-EIP, the mean score increased significantly in both groups; from 40.7±3.4 to 42.0 ± 4.0 in the IG and 31.2±5.2 to 37.8 ± 5.6 in the control group. The increased mean knowledge scores from baseline to immediate post-EIP among IG (8.2 ±5.4) was significantly higher than that of the control group (0.4 ±2.2); ($p < 0.05$). This indicated the fact that educational intervention was effective in improving respondents' knowledge of PU prevention in the intervention group. Knowledge gained at immediate posttest was retained as evidenced by an increase in the 3months posttest score, with facilitating supervision.

The study also determined the effect of selected demographic characteristics (years of experience, educational level, previous exposure to PU lecture) on the scores obtained at posttest. Findings were not statistically significant, suggesting that the selected demographic characteristics did not individually determine the scores obtained at posttest. The results therefore inferred that an exposure to a focused education on PU prevention was a major determinant of the score obtained at posttest.

The interaction effect of intervention with selected demographic characteristics indicated a statistical significant effect ($p<0.05$). For example, on the interaction effect of educational level with intervention, findings suggest that the educational intervention programme interacted positively with level of education to produce the result obtained at posttest. The interaction effect of EIP with years of experience produced a positive increase in knowledge score. A two-way interaction of educational level and years of experience in treatment suggest that as

educational level increased with years of experience, the participants' knowledge score at posttest also increased.

Respondents' score at 3 months posttest in the intervention group was higher than that obtained at the immediate posttest (40.7±3.4 to 42.0 ± 4.0). The possible explanation could be the fact that participants worked in groups during the 3 months post intervention period. This is believed to have facilitated cooperative learning among nurses, resulting in a positive attitude towards PU prevention. Literature confirms that cooperative learning enhances knowledge retention than competitive learning.

In order to determine the effect of knowledge acquired by respondents in the intervention group, a point -prevalence of PU among patients on admission in the selected wards where hands-on practice took place was taken. Findings indicated a reduction in point- prevalence in the intervention group, particularly in LASUTH, from 0.21 to 0.1. In the control hospital, a slight increase was noted from 0.12 to 0.17. This suggests a positive effect of the intervention on patient outcome. However, the mean point- prevalence in the IG before-after intervention was not significant ($p>0.05$). The major limitation was that the patient profile changed before the end of the study since admissions and discharge of patients were ongoing. This possibly contributed to the result obtained.

6.2. Conclusions

The findings of this study accurately accentuate the fact that a focused education on PU prevention is necessary to improve nurses' knowledge and practice of interventions to prevent pressure ulcers. The EIP yielded a positive result as evidenced by increase in knowledge score and by extension a positive patient outcome. Availability of resources also enhanced practice and a positive attitude to care of patients at risk for PU which possibly contributed to a higher knowledge level at 3 months posttest.

The interaction effect of education, years of experience and posttest scores was very significant, suggesting a need to encourage higher education for nurses.

The continuing education unit in various hospitals should be encouraged to include PU prevention as part of their update programme for effective PU prevention. Therefore, organizations need to consider PU prevention as a priority by encouraging nurses with

specialized education to provide leadership to colleagues, through organizing periodic educational programme. This will also improve standard of practice.

6.3. Recommendations

From the findings of this study, the following are recommended:

1. A need to review processes of care to ensure that practices are based on the most rigorous evidence available.
2. An admission risk assessment screening should be incorporated into the nursing admission assessment tool. The major risk factors for pressure ulcer development should be incorporated into the tool.
3. The nursing care plan should be effectively utilized as a framework to communicate the presence of risk factors for pressure ulcer.
4. A nurse-led skin care or PU prevention team is necessary in hospitals to champion the initiative towards maintenance of skin integrity in hospitalized patients.
5. Frequent update on PU prevention through continuing education is a priority.
6. The development of practice guidelines and focused assessment format is quite crucial.
7. A broad-based approach towards PU prevention which goes beyond nursing, to incorporate an interdisciplinary collaboration and communication is advocated.
8. Appropriate distribution of nurses on medical- surgical wards to meet the recommended nurse: patient ratio and patient dependency profile is necessary.
9. Nursing professional organizations in Nigeria need to develop national practice guidelines for PU prevention for the country. These guidelines can be adapted by facilities to suit the peculiarity of their practices.

6.4. Limitations of the Study.

In the study, only one state teaching hospital was included. This may constitute a limitation in the study. At the end of three months, a level of experimental mortality was experienced because some respondents who entered at the beginning did not return for posttest at three months. A possible Hawthorne effect phenomenon was also played out, because some participants could have had a previous exposure to the instrument during the survey phase. This is possible

because rotation of nurses through the different units is a regular practice and the researcher does not have control over such. Also the participants' awareness that they were being monitored and observed could have enhanced the team performance observed in the study.

6.5. Suggestions for Further Studies

In view of the aims, methodology, findings and the implications to nursing, the logical question to answer is what the next thing to be done is. On this premise, the researcher suggests that future studies should consider a wider scope to involve both secondary and tertiary institutions. This will facilitate the generalization of findings.

Studies in the future should also consider the nurses' value for PU prevention. The content of PU prevention in undergraduate and diploma curricula should be investigated.

The impact of PU on patients' clinical outcome should also be considered in the future. It is also suggested that future studies should consider assessment of organizational value and attitude towards PU prevention. This has a great implication for nurses' attitude to PU prevention practices.

6.6. Contributions to Knowledge:

The study contributed to knowledge in the following areas:

The Intervention package developed for the study was effective in improving nurses' knowledge of PU prevention and practice. This can be adopted for use in the continuing education programmes on PU prevention in hospitals.

The deficits in knowledge identified in literature (UCH Nursing Research Unit 2009, Adejumo 2010) were filled using EIP as indicated by the results obtained in the study.

The nurses' documentation of risk assessment for PU improved with the use of the documentation record designed for this study. If this is adopted and integrated into the nursing assessment protocol, it will improve nursing documentation and quality of care.

The study also provided a resource guide (pocket guide) of recommended interventions for PU prevention, which made it easy and was readily available to be consulted during practice. This can also be adopted for use, since there are no practice guidelines in this area of practice at the time of this study.

By the end of the study, it was observed that the process of integration of PU risk assessment into nursing assessment record was already in progress in the University College Hospital. This is a significant contribution of the study to knowledge and nursing practice.

REFERENCES

Adejumo, P.O. 2010. Nurses perception of activities at preventing pressure sore among selected patients at the University College Hospital, Ibadan. *West African Journal of Nursing 21. 2: 90-98.*

Adler M, Goman W. Quality. 1952. *The great ideas: A syntopicon of great books of the Western world*. Encyclopedia Britannica. M. Adler , W. Goman W. Ed. Chicago . 513–6.

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 and Continence Nursing 37.5: 487-494.*

Ayello, E A, Sibbald, G,R 2008: Preventing pressure ulcers and skin tears. *Evidence-based geriatric nursing protocols for best practice.* E. Capezuti, D. Zwicker , M. Mezey , T. Fulmer. Eds. New York (NY); Springer Publishing Company, 403-29.

Ayello, E.A. Capitulo, K. L. Fowler, E. Krasner, D. Mulder, G. Sibbald, G Yankowsky, K.W. 2009: Legal Issues in the care of Pressure Ulcer Patients: Key Concepts for Healthcare Providers.-A consensus paper from the International Expert Wound Care Advisory Panel. *World Council of Enterostoma Therapist* 29.1:8-22.

Ayello EA, Sibbald RG. 2012. Preventing pressure ulcers and skin tears. In: Boltz M, Capezuti E, Fulmer T, Zwicker D, editor(s). Evidence-based geriatric nursing protocols for best practice. 4th ed. New York (NY): Springer Publishing Company; p. 298-323.

Ayello, EA, Zulkowski,KM, Capezuti, E. 2010. Pressure ulcer content in undergraduate programs. *Nursing Outlook* 58. 2: e1- e 34.

Altun, I, Ayten, D. Z . 2011. Knowledge and Management of Pressure ulcer: Impact of lecture-based interactive workshop on training nurses. *Advances in Skin and Wound Care 24 .6: 262-266.*

Aintree University Hospitals, NHS Foundation Trust.2010. Policy for Prevention and Management of Pressure Ulcer. Available @www.nhs.uk/services. Accessed August 3, 2012.

Agency for Healthcare Research and Quality. 2011. Preventing Pressure Ulcer in Hospitals: A toolkit for improving quality of care. Available www.ahrq.gov/research. Accessed June, 6, 2012.

An Bord Altranais . 2005: *Requirements and Standards for Nurse Registration Education Programmes (3rded).* Dublin Stationery Office. Available atwww.nursingboard.ie/ competency/compl/resource.asp. Retrieved March .3 , 2014

Australian Wound management Pressure Ulcer Interest Subcommittee. 2001. Clinical Practice Guideline for the Prediction and Prevention of Pressure Ulcer. West Leederville, W.A: Cambridge Publication. Available http:www.awma.comaupublications. Accessed March, 10, 2009.

Banning M . 2008. A review of clinical decision making models and current research. *Journal of Clinical Nursing* 17. 2: 187-195.

Boyd E & Fales, A.1983. Reflective Learning: the key to learning from experience. *Journal of Humanistic Psychology* 23. 2: 99-117

Braden, B.J, Blanchard, S. 2007. Risk Assessment in pressure ulcer prevention. In Krasner DL, Rodeheaver GT, Sibbald RG. *Chronic Wound Care: A clinical Source Book for Healthcare Professionals, Fourth Edition* . Wayne, PA Health Management Publications, Inc. pp593-608.

Brindle, C.T. 2009. Use of an absorbent soft silicone self-adherent bordered foam dressing to decrease sacral pressure ulcer in the surgical trauma ICU. *Poster presentation on Advanced Wound care and the Wound Healing Society meeting, Dallas, Texas USA.*

Buss Inge, C. Halfens, RJG, Abu-Saad HH, Kok G. 1999. Evidence- based Nursing practice: both state of the art in general and specific to pressure sores. *Journal of Professional Nursing* 15: 73-83.

Butcher, M. Thompson, G. 2010. Pressure ulcer prevention: Can dressings protect from pressure ulcer damage? An advertorial. Available at www.woundsinternational.com. Accessed Nov.20:2010.

Brookfield K.L, Sherperd J. M . 1990. The relationship between clinical-decision making skills in nursing and general critical thinking abilities of senior students in four types of nursing programs. *Journal of Nursing Education 29.* 391-398.

Butcher, M. Thompson, M. 2009. Dressings can prevent pressure ulcer: facts or fallacy? The problem of pressure ulcer prevention. *Wounds UK* 5.4: 95-101.

Black, J, Baharestani, M, Cuddigan J, Dorner B, Edsberg L, Langemo, D, Posthauer, E, Ratliff, C & Taler G. 2007. National pressure Ulcer Advisory Panel's Updated Pressure Ulcer Staging system. *Dermatology Nursing 19 .4: 343-349.*

Berlowitz , D. 2014. Incidence and Prevalence of Pressure Ulcers. In D.R. Thomas and G.A. Compton (eds.), *Pressure Ulcers in the Aging Population: A Guide for Clinicians*, Aging Medicine 1, DOI 10.1007/978-1-62703-700-6_2 © Springer Science+Business Media New York

Brandeis G. H, Morris J. N Nash D.J. Lipsitz L.A. 1990. The Epidemiology and Natural History of Pressure Ulcers in Elderly Nursing Home Residents *Journal of the American Medical Association(JAMA)*264.22: 2905-2909. doi:10.1001/jama.1990.03450220071025.

Bauer, JD. Mancoll, J.S, Phillips L.G. 2007. Pressure Sores. *In Grabb & Smith Plastic Surgery Charles H Thorne* Eds. USA, Lippincott Williams & Wilkins pgs 722-729

Bush C. 2002. Investigating the effects of living with a pressure ulcer. *Nursing Times 98;36: 34.*

Baranosky, S. 2010. Pressure Ulcer Prevention Project Outcome Congress and Celebration: Pressure ulcers: What we all need to know. Available @ www.metastar.com. Accessed 15/2/14.

Bjork, I.T. Hamilton G.A. 2011. Clinical Decision making of Nurses Working in hospital Settings. *Nursing research and Practice. Available at* www.hindawi.com/journal/201. Accessed February, 15. 2014.

Benner, P. 1984. From Novice to Expert: Excellence and Power in Clinical Nursing Practice, Addison-Wesley Publishing, Menlo Park, Calif, USA.

Benner, P. C. Tanner, C. 1987*:* "How expert nurses use intuition," *American Journal of Nursing 87. 1: 23–31*

Calderdale and Huddersfield NHS Foundation Trust. 2009 : Pressure Ulcer prevention and Management Policy. Available @ www.calderdale.nhs.uk. Accessed June, 11. 2012.

Colucciello, M.L. 1997. Critical thinking Skills and disposition of baccalaureate nursing students- A conceptual model for evaluation. *Journal of Professional Nursing* 13 .4: 236-245.

Courtney , B.A. Ruppman, J.B. Cooper, H.M. 2006. Save Our Skin: Initiative cuts pressure ulcer incidence in half. *Nursing Management* 37.4: 36-45

Catania, K. Huang, C. James, P. Madison, M. Moran, M. & Ohr, M. 2007. PUPPI: The pressure ulcer prevention protocol interventions. *American Journal of Nursing,* 107.4:, 44-52. doi: 10.1097/01.NAJ.0000271182.90068.a1

Chicano SG, Drolshagen C. 2009. Reducing hospital-acquired pressure ulcers. *Journal of Wound Ostomy & Continence Nursing*.36.1: 45–50 doi 10.1097/01.WON.0000345175.51117.ca

Cox , J. 2011. Predictors of Pressure ulcer in adult critical care patients. *American journal of Critical care* 20. 5: 364-374

Cooper, K. L. 2013. Evidence _based prevention of Pressure ulcer in the Intensive care Unit. *Critical Care Nurse* 33: 57-67.

Caliri, M.H.L. Miyazaki, M.Y. Pieper, B. 2003. Knowledge of pressure ulcers by undergraduate nursing students in Brazil. *Ostomy/Wound Management* 49. 3:54-63.

Dana Tschannen, AkkeNeel Talsma, Jan Gombert and Jole' L. Mowry 201. Using the TRIP Model to Disseminate an IT-Based Pressure Ulcer Intervention. *Western Journal of Nursing Reseach 33, 427. Available @* http://wjn.sagepub.com/content/33/3/427. Accessed March.28.2012.

Denby, A, Rowlands, A. 2010. Stop them at the door: Should pressure ulcer prevention protocol be implemented in the emergency Department? *Journal of Wound Ostomy and Continence Nursing 37. 1: 35-38.*

Echezona, E.E . 2008. Pressure ulcers. *Unpublished Seminar presentation, National orthopedic hospital Enugu. Nigeria.*

Enein ,E.N.Y. & Zaghloul, A.A. 2011. Nurses' knowledge of prevention and management of pressure ulcer at a Health Insurance Hospital in Alexandria. *International Journal of Nursing Practice* 17.3: 262-268.

Erowele, G. I. Ebiasah, R. 2009: The prevention and treatment of pressure ulcers. Available *http//www.uspharmacist.com/continuing_education/ceviewtest/lessonid.* Accessed May 22. 2009.

Fitzgerald, M. 1994. Theories of Reflection for learning. *In Reflective Practice in nursing,* Palmer A and Burns S .Eds. Blackwell Scientific, Oxford.

Flanagan M. 2008. Improving wound care teaching and learning in clinical practice. *Wounds 4. 4: 96-101.*

Forseth C. D. 2010. Effect of an educational intervention on facility staff knowledge regarding pressure ulcer care. *A professional paper for degree of Master in Nursing. Submitted to the Montana State University.* Available @ www.etd.lib.montana.edu/etd/2010/forseth. Accessed March, 30 2012.

Frantz,R., Xakellis, G. C. and Arteaga, M. 1993. 'The effects of prolonged pressure on skin blood flow in elderly patients at risk for pressure ulcers', *Decubitus* 6. 16-20

Fowler, E. 2009. Deposed: A personal Perspective. In Ayello et.al Legal Issues in the care of Pressure Ulcer Patients: Key Concepts for Healthcare Providers. A consensus paper from the International Expert Wound Care Advisory Panel. *World Council of Enterostomal Therapist* 29.1:8-22

Grant, A, Kinnersley, P. Metcalf, E. Pill, R. Housten, H. 2006. Students' view of reflective learning techniques: An efficacy study at UK medical school. *Med. Educ. 40. 6: 376-388.*

Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. 2005. *Diffusion of innovations in health service organizations: A systematic literature review*. Malden, MA: Blackwell.

Gunningberg, L 2004. Pressure ulcer prevention: Evaluation of an education program for Swedish nurses. *Journal of Wound Care 13. 3: 85-89.*

Gunningberg, L. Lindholm, C. Carlsson, M. & Sjoden, P. O. 2001. Risk, Prevention and Treatment of Pressure Ulcers - Nursing Staff Knowledge and Documentation [Electronic Version]. *Journal of Scand Caring Science* 15. 257-263.

Gordon, S. Buchanan, J. Bretherton, T. 2008. Safety in Numbers: Nurse-to–patient ratio and the future of healthcare. Cornell University Press. Available @www.amazon.com. Accesed July. 31, 2012.

Gerdtz, M. Nelson, S. 2007. 5-20: A model of minimum nurse- to-patient ratio in Victoria, Australia. *Journal of Nursing Management* 15. 64-71.

Gantz, N.R. Sorenson, L. & Howard, R.L. 2003. A collaborative perspective on nursing leadership in quality improvement: The foundation for outcomes management and patient/staff safety in health care environments. *Nursing Administration Quarterly* 27. 4: 324-329.

Griffins, B., Cooper, H., Horack, C., Klyber, M., and Schimmelpfenning, D. 2007. Best-practice protocols: Reducing harm from pressure ulcers. *Nursing Management.* Retrieved from: www.nursingmanagement.com January, 24. 2014.

Hayes, P.A. Wolf, Z.R. McHugh, M.K. 1994: Effect of a teaching plan on nursing staff's knowledge of pressure ulcer risk, assessment and treatment. *Journal of Staff Development* 10. 4: 207-213.

Hulsenboom, M. A, Bours, G.J.J.W, Halfens R.J.G. 2007. Knowledge of pressure ulcer prevention: A sectional and comparative study among nurses. *BMC Nursing. Available at www.biomedcentral.com. Accessed Sept. 21, 2010.*

Harteloh P.P.M. 2003. The meaning of quality in health care: a conceptual analysis. *Health Care Analysis* 11. 3:259–67.

Hayden C, Piper E, Malfitano J, et al. 2009. Champions Improve Staff Education and Compliance with Pressure Ulcer Prevention Strategies. IHI Improvement Report. Available www.ihi.org/IHI/Topics/MedicalSurgicalCare/MedicalSurgicalCareGeneral/Im. Accessed January, 23 2014

Hopkins, B. Hanlon, M. Yank, S. Sykes, S. Rose, T. Cleary, A. 2000. Reducing nosocomial pressure ulcer in acute care facility. *Journal of Nursing care Quality* 14. 28-36

Hyun S, Vermillion B, Newton C, Fall M, Li X, Kaewprag P, Moffatt-Bruce S, & Lenz ER. 2013. Predictive Validity of Braden Scale for Patients in Intensive Care Units. *American Journal of Critical Care 22. 6: 514- 520.*

Hess, C.T. 2008: Practice Points: Managing tissue loads. *Advances in Skin and Wound care: the journal for prevention and Healing* 21. 3: 144

Hartford Institute for geriatric Nursing (HIGN). 2008 . Preventing Pressure Ulcers and Skin Tears. In Capezuti, E. Zwicker D, Mezey, M Fulmer ,T Eds : Evidence based geriatric Nursing Protocols for best practice (3rd ed). New York(NY) Springer Publishing Company, Inc. P 403-429.

Hertfordshire Community. 2010. Tissue Viability Nursing. *Hertfordshire community NHS Trust. Available @www.hertschs.nhs.uk.* Accessed February 16 2014.

Hobson, D.A. 2003. Comparative analysis of posture on pressure and shear at the body-seat interface. *Journal of Rehabilitative Research and Development 29. 4: 21*

Idowu, O.K Yinusa, W. Gbadegesin, S.A, Adebule, G.T. 2011. Risk factors for pressure ulceration in a resource constrained spinal injury service. *Spinal Cord* 49. 634–647

Institute for Healthcare Improvement. 2009. Improvement report: Relieve the pressure and reduce harm. Retrieved from http://www.ihi.org/IHI/Topics/PatientSafety/ SafetyGeneral/ImprovementStories/FS. Accessed April 13, 2012.

Iyun, A.O. Malomo, A.O. Oluwatosin, O.M, Ademola, S.A & Shokumbi, M.T : *Patterns of presentation of PU in traumatic spinal cord injured patients in UCH, Ibadan, International Wound Journal. Available @ onlinelibrarywiley,com.* Accessed Dec. 22. 2011.

Institute of Medicine (IOM) 2001. Keeping patient safe: Transforming the work environment of Nurses. Washington DC, National Academic Press.

Jankowski , I.M. Nadzam, D.M. 2011. Identifying gaps, barriers and solutions to implementing pressure ulcer prevention programs. *Journal of Joint Commission on Quality and Patient Safety* 37. 6: 253-64.

Johnson, D. W, Johnson, R.T, Smith, K.A. 1998. Active learning: Cooperative in the College classroom. 2nd ed. Edina MN, Interaction Books Company.

Johnstone, A. Hodgson H. 2009. Tissue viability. Available @ nhsggc.org.uk wound management for A Johnstone. Accessed February 12, 2014.

Janis, J.E. and Kenkel, J.M.2003. Pressure Sores. *Selected Readings in Plastic Surgery.* 9 . 39. Available @ umw-imsc.duhs.duke.edu. Accessed Dec.12, 2013.

Knowles, M. 1990. The adult learner: A neglected species. Houston, TX: Gulf Publishing Company.

Knowles, M.S., Holton, E. F., & Swanson, R. A. 1998. The adult learner: The definitive classic in adult education and human resource development (5th ed.). Houston, TX: Gulf. M. Kristen, De Vito, 2010. Implementing adult learning principles to overcome barriers of learning in continuing higher education programs. *Online Journal of Workforce Education and Development* 2009, 3 :4

Kolb, D.A. 1984. Experiential learning experiences as the source of learning and development. New Jersey: Prentice Hall.

Labiak J. 2008 . Effect of pressure ulcer educational intervention on nursing staff. *A paper presented at Wounds Ostomy and Continence Nursing (WOCN), 40th* Annual Conference. June 21st-25th, 2008.

Langemo, D.K. 2005. Quality of Life and Pressure Ulcers: What is the Impact? *Wounds 17. 1: 3-7.*

Lindgren, M. Unosson, M. Krantz, A-M, Ek A-C. 2002. A risk assessment scale for prediction of pressure sore development: reliability and validity. *Journal of Advanced Nursing* 38. 2: 190-199.

Lindgren, M. Unosson, M. Fredrikson, M. Ek, A-C. 2004. Immobility-A major risk factor for development of pressure ulcer among adult hospitalized patients: A prospective study *Scandinavian Journal of caring science 18. 57-64*

Lyder, C. 2003. Pressure ulcer prevention and management . *Journal of American Medical Association (JAMA) 289. 2: 223-226.*

Lyder, C. H. Ayello, E. A. 2008. Pressure ulcers: A patient safety issue. R. G. Hughes .Ed., *Patient safety and quality: An evidence-based handbook for nurses*. Rockville, MD: Agency for Healthcare Research and Quality .Vol. 1: 163-177.

Leijon, S. Berg, I. Terstappen, K. 2013. Pressure Ulcer Prevalence, Use of Preventive Measures, and Mortality Risk in an Acute Care Population: A Quality Improvement Project . *Journal of Wounds Ostomy and Continence Nursing* 40. 5: 469-474

Lewis, S.L. Heitkemper, M.M. Dirksen, S. R.O'Brien,P.G. Bucher, L. 2007. Medical-Surgical Nursing: Assessment and management of clinical Problems. St. Louis Missouri, Mosby Elsevier.

Miyazaki,M.Y, Caliri, M. H, Santos,C.B. 2010. Knowledge on pressure Ulcer prevention among Nursing prefoessionals. *Rev.Latino-Am.Enfermagem* 18. 6: 1203- 1211.

Moore, Z, Price, P. 2004. Nurses attitude, behaviors and perceived barriers towards PU prevention. *Journal of Clinical Nursing 13. 8: 942 -951.*

McGillis Hall L, Buch E. 2009. Skill mix decision-making for Nursing. *International Centre for Human Resources in Nursing, Geneva: ICN. Available @ www.mcgillishall.com* . Accessed February 9, 2013.

Maben, J. Latter, S. Clark, J.M. 2006. The theory-practice gap: Impact of professional bureaucratic work on newly qualified nurses. *Journal of Advanced Nursing* 55.4: 465-77

Moore Z. 2010: Bridging the theory-practice gap in Pressure ulcer prevention. *British Journal of Nursing* 19. 15: S15-S18.

Moraga, R. Rahn, R. 2012. Studying Knowledge retention through cooperative learning in an Operation Research. Available @ www.niu.edu. Accessed April 11, 2012.

Mitchell, P.H, Lang,N.M. 2004. Nurse staffing: A structural proxy for hospital quality? *Med Care* 42. 1: 1–3.

Mitchell, P.H. Soule, E.S. 2008. Defining Patient Safety and Quality. In Hughes, R.G (ed): Patient Safety and Quality: An evidence –based handbook for Nurses. USA, Rockville (MD): Agency for Healthcare Research and Quality.

Mathus-Vliegen EM. 2004: Old age, malnutrition and pressure sores: an ill-fated alliance *Journal of Gerontol A Biol Sci Med Sci* 59. 4 :355-60.

Margolis, D.J. Knauss, J. Bilker, W, Baumgarten, M. 2003. Medical conditions as risk factors for pressure ulcers in an outpatient setting. *Age and Ageing 32. 3 259-264*

McErlean B.N , Prendergast, J. Sandison, S. Jeffers, L. MilneJ A. Cotton,J Humphreys,W. 2002. Implementation of a preventative pressure management framework. *Primary Intention* 10. 2: 61-66.

Nelson, A. Powell-Cope, G. 2006. Nursing Care Priority Area. In Cowen & Moorhead: Current Issues in Nursing. 7th ed. USA, Mosby Publishing. Pp 270-282.

National Pressure Ulcer Advisory Panel-European Pressure Ulcer Advisory Panel (NPUAP-EPUAP). 2009: Pressure Ulcer Treatment: Quick Reference Guide. Washington DC: National Pressure Ulcer Advisory Panel. *Available @ www.npuap.org*. Retrieved February 6, 2014.

National pressure Ulcer Advisory Panel (NPUAP) 2012. Shear: A contributory factor in pressure ulceration: A presentation aimed at clinicians and associated professionals. Available at *www.npuap.org*. Accessed March 4, 2014.

Nursing Research Unit, University College Hospital. 2009. Nurses Knowledge of pressure ulcer prevention in University College Hospital, Ibadan. *Unpublished Seminar Presentation, Nursing Research Unit, University College Hospital, Ibadan.*

Nightingale, F. 1854 'I have done my duty'. S.M. Goldie. Ed. *Florence Nightingale in the Crimean War, 1854–56.* Manchester: Manchester University Press . 1988

Niederhauser, A. Lukas, V. Parker, V, Ayello, E.A. Zulkowski, K. Berlowitz, D. 2012. Comprehensive Programs for Preventing Pressure Ulcers: A Review of the Literature **:** *Advances in Skin & Wound Care: Journal for Prevention and Healing 25. 4: 167-188*

Oluwatosin, O.M. Malomo, A.O. Oluwatosin, O.A. Shokunbi, M.T. 1998. Management of pressure Ulceration using fenestrated foam and honey. *Quarterly Journal of Hosp. Med. 8: 264-266.*

Onche, I.I Yiltock, S.K Obiano, S.K. 2004. Pressure ulcers in spinal cord injury patients in Gombe, Nigeria. *Nigerian Journal of Orthopedics and trauma* 16. 1: 57-60

Orsted, H. L. Rosenthal, S. Woodbury, G.M. 2009. Pressure ulcer Awareness and prevention Program: A quality improvement program through the Canadian Association of Wound care. *Journal of Wound, Ostomy and Continence Nursing 36.2*: 178-183.

Orsted, H. 2009. Innovations in Pressure ulcer prevention and management: Targeted interventions that reduce prevalence. *Wounds International 1: 1. Available @www.woundsinternational.com.* Accessed February 16, 2014.

Osted H.L. Ohura, T. Harding, K. 2010. Pressure ulcer prevention: Shear, friction and microclimate in Context: A consensus document . *Wounds International* . *Available* *www.woundsinternational .com.* Accessed February 4, 2014.

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

Pancorbor-Hidalgo PL, Garcia-Fernandez FP, Lopez-Madina IM, & Lopez-Ortega J. 2007. Pressure ulcer care in Spain: Nurses' knowledge and clinical Practice. *Journal of Advanced Nursing 58.4: 327-338.*

Pancorbor-Hidalgo, P.L, Garcia-Fernandez, F.P, Lopez-Madina, I.M, Alvarez-Nieto, C .2006. Risk Assessment scales for pressure ulcer prevention: A systematic review. *Journal of Advance nursing* 54. 1: 94-110.

Pieper, B. Mott, M. 1995. Nurses' knowledge of pressure ulcer prevention, staging and description. *Advanced Wound Care* 8. 3: 34-48.

Polit, D. F. Beck, C.T. 2004. Nursing Research: Principles and methods. 7th Ed. Philadelphia: Lippincott Willaims & Wilkins, A Wolters Kluwer Company.

Padula, C.A. Osborne, E. Williams, J. 2008. Wound Care: prevention and early detection of pressure ulcers in hospitalized patients. *Journal of Wounds ,Ostomy and Continence Nursing* 35. 1: 66-75.

Rogers, E. M. 2003. Innovation in organizations. E. M. Rogers .Ed. *Diffusion of innovations* 5th ed . New York: Free Press.

Revis, Jr D .R. 2008. Decubitus Ulcers . Available at www.*emedicine.com/med/topic2709.htm* retrieved February 7, 2014.

Sanders, J. 2009. The use of reflection in medical education: AMEE Guide NO.4. *Available @www.medsqueensu.ca.* Accessed April 7, 2012.

Shahin, E. S. Dassen, T. Halfens, R. J. 2009. Incidence, prevention and treatment of pressure ulcer in intensive care patients: A longitudinal study. *International Journal of Nursing Studies 46 .4: 413-421*

Shoemaker, S. Stoessel, K. 2011. Pressure ulcer in the Surgical patients. *The Clinical Issue 1. Available @ www.haiwatch.com.* Accessed Nov. 16, 2011.

Sinclair, L. Berwiczonek, H. Thurston N, Butler S, Bulloch G, Ellery C, Giesbrecht G: 2004. Evaluation of an evidence-based education program for pressure ulcer prevention. *Journal of Wound Ostomy and Continence Nursing 31. 1: 43-50.*

Smith, D. Waugh, S. 2009. An Assessment of nurses' knowledge of pressure ulcers prevention and treatment. *The Kansas Nurse 84. 1: 3-5.*

Sobral, D. 2000. An Appraisal of medical students' reflection-in-action. *Med.Educ.34: 182-187.*

Stevens, J. Gray, W. 2005: *New guideline on preventing and managing pressure ulcer. Nursing Times* 101. 46: 40.

Strand, T. Lindgren, M. 2010. Knowledge, attitude and barriers towards prevention of pressure ulcer in Intensive Care Units: A descriptive cross sectional study. *Intensive and Critical care Nursing 26. 6: 335-342.*

Simpson, E. Courtney, M. 2002: Critical thinking in Nursing Education: Literature review. *International Journal of Nursing Practice* 8. 2: 89-98.

Shojania K.G, Duncan B. W, McDonald K.M, et al.Eds. Rockville, MD: Agency for Healthcare Research and Quality; Jul, 2001. Making health care safer: A critical analysis of patient safety practices. *Evidence Report/Technology Assessment; No 43 (Prepared by the University of California at San Francisco-Stanford Evidence-based Practice Center under Contract No 290-97-0013).* AHRQ Publication No. 01-E058, Summary.

Scemons D, Elston D. 2009. Nurse to Nurse Wound Care: Expert Interventions. New York, McGraw Hill pg 57 -98.

Sibbald RG, Krasner DL, Lutz JB, et al. 2008. The SCALE Expert Panel: Skin Changes at Life's End. Preliminary Consensus Document. Available at: http://www.gaymar.com. Accessed February 2, 2014.

Salcido R. 2008. Pressure ulcers: the power of detection (editorial). *Adv Skin and Wound Care* 21. 7: 305-11.

Schoonhoven, L. Defloor, T. & Grypdonck, M.H. 2002. Incidence of pressure ulcers due to surgery. *Journal of Clinical Nursing, 11*. 4: 479–487.

Titler, M. G. 2008. The evidence for evidence-based practice implementation. R. Hughes Ed. *Patient safety & quality—An evidence-based handbook for nurses* Rockville, MD:

Agency for Healthcare Research and Quality. Retrieved from http://www.ahrq.gov /qual/nurseshdbk . 126-145.

Titler, M.G. Everett, L. Q. 2001. Translating research into practice: Considerations for critical care investigators. *Critical Care Nursing Clinics of North America 13*. 587-604.

Tweed C. Tweed M. 2008. Intensive care nurses knowledge of pressure ulcers: Development of an assessment tool and effect of an educational Program. *American Journal of Critical Care* 17. 4: 338-346.

Wounds Ostomy and Continence Nursing (WOCN). 2006. WOCN Society Position Statement: Pressure Ulcer Staging. Retrieved from *www.wocn.org* . Accessed February 16, 2014.

Wound Ostomy and Continence Nursing Society. 2009. Position Statement on Avoidable and Unavoidable Pressure Ulcers. *Journal of Wounds Ostomy and Continence Nursing 36. 4: 378-381*.

Wound, Ostomy and Continence Nurses Society. 2010: *Guideline for prevention and management of pressure ulcers.* Mount Laurel, NJ 08054.

Wandelt MA. 1976. Definitions of words germane to evaluation of health care. *NLN Publ*. 15-1611: 57–8.

Willock J, Hughes J, Tickle S . 1999. Pressure sores in children - the acute hospital setting**.** *Journal of Tissue Viability* 10. 2: 59-65.

Yoshikawa, T. T. Livesley , N .J. Chow,A. W. 2002. Infected pressure Ulcers in elderly individuals. *Clinical infectious Diseases 35. 1390-6*

Appendix I

INFORMED CONSENT FORM

Dear sir/Ma,

Title of the research: Effect of an educational intervention programme on nurses knowledge and practice of pressure ulcer prevention strategies in selected teaching hospitals in south west Nigeria

This study is being conducted by Mrs. Rose Ekama Ilesanmi, a PhD student of the University of Ibadan, Ibadan.

Purpose of research: The purpose of this study is to assess your knowledge of pressure ulcer preventive practices and to conduct an educational program to improve your knowledge in this area.

Procedure of the research: This study involves 3 teaching hospitals and participants will be selected from 3 different wards in each hospital. A total of 193 nurses will be involved. You will be required to complete a questionnaire (Pretest) before the workshop begins.

Immediately after the workshop, another questionnaire (Post test I) will be given to you to measure how much knowledge you have gained from the program. Your practice will be monitored for 3 months by the researcher, after which you will be required to complete another test (Post test II). For this reason, you will be given an identification number.

Duration of study: On the whole you will be involved in this study for 3 months. The researcher will visit you on the ward to evaluate your practice every 2 weeks.

Risks: The study does not involve any form of medications; therefore you are not at any risk. Rather the study will enhance the care you are providing to your patients.

Cost to participants: Your participation in this study will cost you 30 minutes of your time.

Confidentiality: Your name will not be required, therefore information provided for this study cannot be linked to you The information will be used purely for academic purposes and your name/identification numbers will not be used in the publication or report of this study.

Voluntariness: Your participation in this study is entirely voluntary. If you choose to withdraw your participation during the course of the study, no penalty is attached to that.

Due Inducement: You will not be paid fee for participating in this study but refreshments will be provided to compensate for your time.

Consequences of participants' decision to withdraw from research and procedure for orderly termination of participation: You can choose to withdraw from the study at anytime. Please note that some of the information that has been obtained about you before you chose to withdraw can no be removed anymore and therefore may be used in the reports and publications. However the researcher promises to make good faith effort to comply to your wishes as much as is practicable.

What happens to participants when research is over? The researcher will inform you of the outcome of the study, as the report will be submitted to your institution.

Any apparent or potential conflict of interest: The researcher does not own share in any wound care company which provided support for this research. The researcher is not aware of any other information that may cause her not to do her work with fear or favour.

Statement of person obtaining informed consent:

I have fully explained this research to ---------- and have given sufficient information, including risk and benefits to make an informed decision.

DATE---------- SIGNATURE----------

NAME:----------

Statement of person giving consent:

I have read the description of the research. I understand that my participation is voluntary . I know enough about the purpose, methods, risks and benefits of the research to judge that I want to take part in it. I understand that I may freely stop being part of this study at any time. I have received a copy of this consent form and additional information sheet to keep for myself.

DATE---------NAME ---------- ---------- SIGNATURE ----------

WITNESS'NAME----------. SIGNATURE----------

Detailed contact information

This research has been approved by the Health Research Ethics Committee of the University of Ibadan and the chairman of this committee can be contacted at Biode Building, Room T10 2nd floor, Institute of Advanced Medical Research and Training (IMRAT), College of Medicine, University of Ibadan. Email:uiuchirc@yahoo.com. In addition, If you have any questions about your participation in this research, you can contact the principal investigator, Mrs. Rose E. Ilesanmi, Department of Nursing, University of Ibadan. Email: ekamailesanmi@yahoo.com. 08035195504.

PLEASE KEEP A COPY OF THE SIGNED INFORMED CONSENT.

Appendix II

Questionnaire

SECTION A: BIODATA

Please supply the information related to your biodata by indicating by writing the figure appropriate to your response into the boxes provided.

1. Gender: Male 1 Female 2 ----------( )
2. Age at last birthday: ----------(Pls indicate actual age)
3. Religion: Christianity 1 Islam 2 Others 3-------( )

4. Professional Category:----- RN/RM only .
   ---------BSc (Nursing)
   ----------Msc (Nursing)
   ----------Others (Pls Explain)
5. Professional cadre: Staff Nurse(1), NO(2), SNO (3), PNO (4), CNO(5) ( ).

6. Years of experience in direct patient –care (Excluding years of nursing education). ----------
7. Your primary patient-care Unit : ----------Clinical neuroscience
   --------Accident and emergency. ------Medical Inpatients.
   ------ Surgical inpatients. ----------Critical care/ICU
   --------renal program. ----------Surgical services and Outpatient clinics.
   ---------- Others (specify).
8. When was the last time you **listened to a lecture** on pressure ulcers?
---------(Pls indicate period, e.g. 1 month ago, etc.)
9. When was the last time you **read an article** or other information on pressure ulcers? ----------(Pls specify)
10. In your career as a nurse, have you ever attended an in-service training on assessment and management of risk for pressure ulcer? Yes () No ()

11. If yes, How long ago?---------

SECTION B: ASSESSMENT OF KNOWLEDGE OF PRESSURE ULCER RISK FACTORS AND STAGING

Please answer each of the following: **True:1 False:2 or Don't know 3 for each question as appropriate.**

	1	2	3
12. Stage I pressure ulcers are defined as nonblanchable erythema	True ___	False____	Don't Know __
13. Risk factors for development of pressure ulcers are immobility, incontinence, impaired nutrition, and altered level of consciousness.	True ____	False____	Don't Know __
14. All individuals at risk for pressure ulcers should have a systematic skin inspection at least once a week.	True _____	False___	Don't Know__
15. Hot water and soap may dry the skin and increase the risk for pressure ulcers	True _____	False___	Don't Know__
16. It is important to massage bony prominences	True _____	False___	Don't Know __
17. A stage III pressure ulcer is a partial thickness skin loss involving the epidermis and/or dermis.	True _____	False____ _	Don't Know __
18. All individuals should be assessed on admission to a hospital for risk of pressure ulcer development	True ___	False____	Don't Know___
19. Corn starch, creams, transparent dressings (i.e., Tegaderm, Opsite), and hydrocolloid dressings (i.e., DuoDerm, Restore) do not protect against the effects of friction.	True _____	False------	Don't Know___
20. Stage IV pressure ulcers are a full thickness skin loss with extensive destruction, tissue necrosis or damage to muscle, bone, or supporting structure.	True ___	False____	Don't Know___
21. An adequate dietary intake of protein and calories should be maintained during illness.	True ___	False ___	Don't Know__
22. Persons confined to bed should be repositioned every 3 hours.	True _____	False___	Don't Know___

23. A turning schedule should be written and placed at the bedside.	True _____	False____	Don't Know___
24. Heel protectors relieve pressure on the heels.	True _____	False____	Don't Know __
25. Donut devices/ring cushions help to prevent pressure ulcers	True _____	False____	Don't Know__
26. In a side lying position, a person should be at a 30-degree angle with the bed.	True ___	False____	Don't Know___
27. The head of the bed should be maintained at the lowest degree of elevation (hopefully, no higher than a 30 degree angle) consistent with medical conditions.	True ___	False____	Don't Know___
28. A person who cannot move self should be repositioned while sitting in a chair every two hours.	True____	False____	Don't Know___
29. Persons who can be taught should shift their weight every 30 minutes while sitting in a chair.	True _____	False___	Don't Know___
30. Chair-bound persons should be fitted for a chair cushion.	True ____	False____	Don't Know___
31. Stage II pressure ulcers are a full thickness skin loss.	True _____	False ___	Don't Know__
32. The epidermis should remain clean and dry.	True ____	False _____	Don't Know___
33. The incidence of pressure ulcers is so high that the government has appointed a panel to study risk, prevention, and treatment.	True ____	False____	Don't Know___
34. A low humidity environment may predispose a person to pressure ulcers.	True_____	False____	Don't Know___
35. To minimize the skin's exposure to moisture on incontinence, underpads should be used to absorb moisture.	True_____	False __	Don't Know___
36. Rehabilitation should be instituted if consistent with the patient's overall goals of therapy.	True_____	False____ _	Don't Know___

37. Slough is yellow or creamy necrotic tissue on a wound bed.	True _____	False___	Don't Know___
38. Eschar is good for wound healing.	True _____	False____	Don't Know___
39. Bony prominences should not have direct contact with one another.	True _____	False___	Don't Know___
40. Every person assessed to be at risk for developing pressure ulcers should be placed on a pressure-reducing bed surface.	True ___	False____	Don't Know___
41. Undermining is the destruction that occurs under the skin.	True _____	False___	Don't Know___
42. Eschar is a healthy tissue.	True _____	False___	Don't Know___
43. Blanching refers to whiteness when pressure is applied to a reddened area.	True _____	False___	Don't Know___
44. A pressure relieving surface reduces tissue interface pressure below capillary closing pressure.	True _____	False____	Don't Know___
45. Skin, macerated from moisture, tears more easily.	True _____	False___	Don't Know___
46. Pressure ulcers are sterile wounds.	True _____	False------	Don't Know-----
47. A pressure ulcer scar will break down faster than unwounded skin.	True -------	False------	Don't Know-----
48. A blister on the heel is nothing to worry about.	True------	False------	Don't Know-----
49. A good way to decrease pressure on the heels is to elevate them off the bed.	True------	False------	Don't Know-----
50. All care given to prevent or treat pressure ulcers must be documented.	True-----	False------	Don't Know----
51. Vascular boots protect the heels from pressure.	True----	False------	DontKnow----
52. Shear is the force which occurs when the skin sticks to a surface and the body slides.	True-------	False------	Don't Know----
53. Friction may occur when moving a person up in	True------	False------	Don't Know-----

bed. -

54. A low Braden score is associated with increased pressure ulcer risk. True------ False------ Don't Know-----

55. The skin is the largest organ of the body. True ------ False------ Don't Know-----

56. Stage II pressure ulcers may be extremely painful due to exposure of nerve endings. True------- False----- Don't Know-----

57. For persons who have incontinence, skin cleaning should occur at the time of soiling and routine intervals. True ------- False------ Don't Know-----

58. Educational programs may reduce the incidence of pressure ulcers. True------ False------ Don't Know-----

Section C: MOST COMMONLY USED NURSING INTERVENTIONS FOR MANAGEMENT OF RISK FOR PRESSURE ULCERS

Instructions: lease respond to the following by indicating the extent to which these interventions are used in your hospitals. **Mostly used (MU), Occasionally Used (OU), Not Used at all (NU), Don't Know (DK).**

		MU	OU	NU	DK
59.	Risk assessment scales to predict risk on all patients on admission.				
60.	Risk assessment scales to predict risk on all patients on admission.				
61.	Patients level of risk is based only on Nurses clinical judgment and experience.				
62.	Skin assessment is carried out on every patient on admission.				
63.	Application of powder to vulnerable areas				
64.	Two hourly repositioning schedule for bed- fast patients.				

65.	Patients are dragged across the bed to facilitate turning.				
66.	Head of bed are elevated (Medium Fowlers) for patient comfort.				
67.	Pillows are used on bony prominences reduce tissue load				
68.	Standard mattresses are used for vulnerable patients.				
69.	Massage of bony prominences in at-risk patients.				
70.	Devices like trapeze, bed rails to promote independent positioning.				

Section D : FACTORS THAT HINDER/SUPPORT PREVENTIVE PRACTICES.

Instruction: Please respond as accurately and honestly as possible, the extent to which each statement applies to you in terms of barriers/hindrances to preventive practice**.**

(SA= Strongly Agree A=Agree UN = Undecided D = Disagree SD= Strongly Disagree)

	Barriers to preventive practice	SA	A	UN	D	SD
71.	Inadequate manpower					
72.	Overcrowding in the wards.					
73.	Lack of adequate linens on the wards					
74.	Lack of standards in the hospital					
75.	Lack of disposable materials.					
76.	Lack of access to relevant literature					
77.	Lack of Knowledge of evidence –based practices.					
78.	Poor knowledge of an existent risk assessment tool.					
79.	Lack of nurses' independence in clinical decision making					
80.	No pressure distributing appliances					
81.	No commitment by management.					

APPENDIX III

RISK- BASED PREVENTION INTERVENTION CHECK LIST

Date----------

Was nursing practice changed as a result of educational intervention? The following criteria operationally define change in practice:

	Yes	No	Tally	
Was a pressure ulcer risk assessment done on admission using the Braden scale?			# yes	Total #
Was a pressure ulcer risk assessment done every 48 hours?				
Was a comprehensive skin assessment done 24hrs after admission?				
Were Interventions implemented as indicated?				
Was the patient's head of the bed at 30 degrees or less?				
Was patient turned and repositioned as per the individualized turning schedule?				
Intervention for incontinent patient (containment device)				
Skin protection for incontinent patient				
Pressure redistribution using support surface and/or cushion				
Was care plan consistently evaluated and revised based on current needs?				
For at –risk patients with pressure reducing support surface, was effectiveness of support surface ('bottoming out') periodically checked?				

Appendix IV

EDUCATIONAL INTERVENTION PACKAGE ON PRESSURE ULCER PREVENTION

CONTENT

Introduction to the workshop: PU prevention is a quality improvement and patient safety initiative which is central to nursing. PU increases patient suffering and pain as well direct cost of management and hospital stay. A focused educational programme is documented to be an effective strategy to improve nurses' knowledge of PU prevention. A positive change in practice maybe influenced by an organizational culture which supports PU prevention initiative.

Background: Inconsistency in practices on PU prevention is principally associated with absence of practice guidelines. Several indicators point to inadequate focused education on current recommended practices, which therefore leaves the nurses utilizing interventions which may be considered obsolete in most instances. Clinical observations of lack of practice guidelines, nursing documentation record for PU risk assessment and re-assessment makes this training very necessary.

Problem: Pressure ulcer constitutes a healthcare challenge to patients, families and the healthcare system. It causes pain, disfigurement and suffering, slow recovery from comorbid conditions, interfere with activities of daily living, and are strongly associated with longer hospital stays and mortality.

Need for training: The goal of the educational programme is to achieve an improvement in PU prevention strategies implemented by nurses in the selected facilities, through sharing best available scientific knowledge in this area of practice. Literature suggest significant gaps and deficit in knowledge of PU prevention among nurses in our local hospitals.

SESSION I : Introduction to training workshop

Module One:

- Overview of the anatomy and physiology of the skin
- Definition of pressure ulcer and Patho-physiology of pressure ulcer.
- Tissue tolerance: Normal physiology

- Risk factors for pressure ulcer development.
- Staging of pressure ulcer

Module Two: Assessment.

- Assessment of individual at risk for pressure ulcer: Identification of risk factors, inspection of skin integrity,
- Assessment for immobility
- Assessment for friction and shearing
- Assessment for moisture and incontinence
- Assessment of nutritional status
- Use of Braden Risk Assessment Tool.

Module Three. Preventive Interventions

- Positioning standards.
- Methods to minimize friction and shear
- Techniques to manage tissue load: Static Support surfaces
- Interventions for skin care
- Correcting nutritional deficiencies

Module Four: Education of patient and family:

- Skin care.
- Measures to reduce friction and shear
- Nutrition and fluid intake

Module Five : Documentation.

- Documenting Risk assessment using Braden scale on admission
- Scoring and interpreting Braden scale
- Follow-up documentation
- Turning schedule
- Nutritional assessment

OUTLINE FOR PRESSURE ULCER PREVENTION EDUCATIONAL PROGRAM.

METHODS: Lecture. Discussion, video clips and hand outs and hands-on sessions.

Workshop materials: Posters, hand bills, projectors for power point presentations**.**

Personnel: Research assistants who are nurses (teachers) would be recruited and trained.

Objectives of the training:

1. To equip nurses who provide direct patient care with the knowledge and skills for assessment and identification of risk for pressure ulcers.
2. To empower nurses with the necessary skills to manage identified risk for pressure ulcer in hospitalized patients and to assess the adequacy of an intervention.
3. To provide a protocol and a standard for pressure ulcer risk assessment and management, which facilitates pressure ulcer prevention.

SESSION I:

TOPIC: INTRODUCTION TO TRAINING WORKSHOP.

Objectives: At the end of the session, participants should be able to:

1. Familiarize with one another.
2. Become acquainted with the program of the workshop
3. Carry out a pre-test
4. Discuss their personal expectations from the program.

OVERVIEW OF LOGISTICS.

- Give an outline of the program content for each day.
- Stress the importance of daily attendance and complete
- Stress the need for a chosen identification code/number
- Signing of a daily attendance register.

PRE-TEST: (Questionnaire)

Explain the rationale for the pre-test to participants, which is to provide a baseline data for assessment of participants' knowledge before the training session.

SESSION 11: Module I: TOPIC: ANATOMY AND PHYSIOLOGY OF THE SKIN.

Objectives: At the end of this session, participants will be able to **:**

1. Provide an overview of the structure and functions of the skin.
2. Define pressure ulcer and understand the physiology of pressure ulcer development.
3. Identify the risk factors for skin breakdown.
4. Describe the cellular and muscular response to pressure .

Introduction.

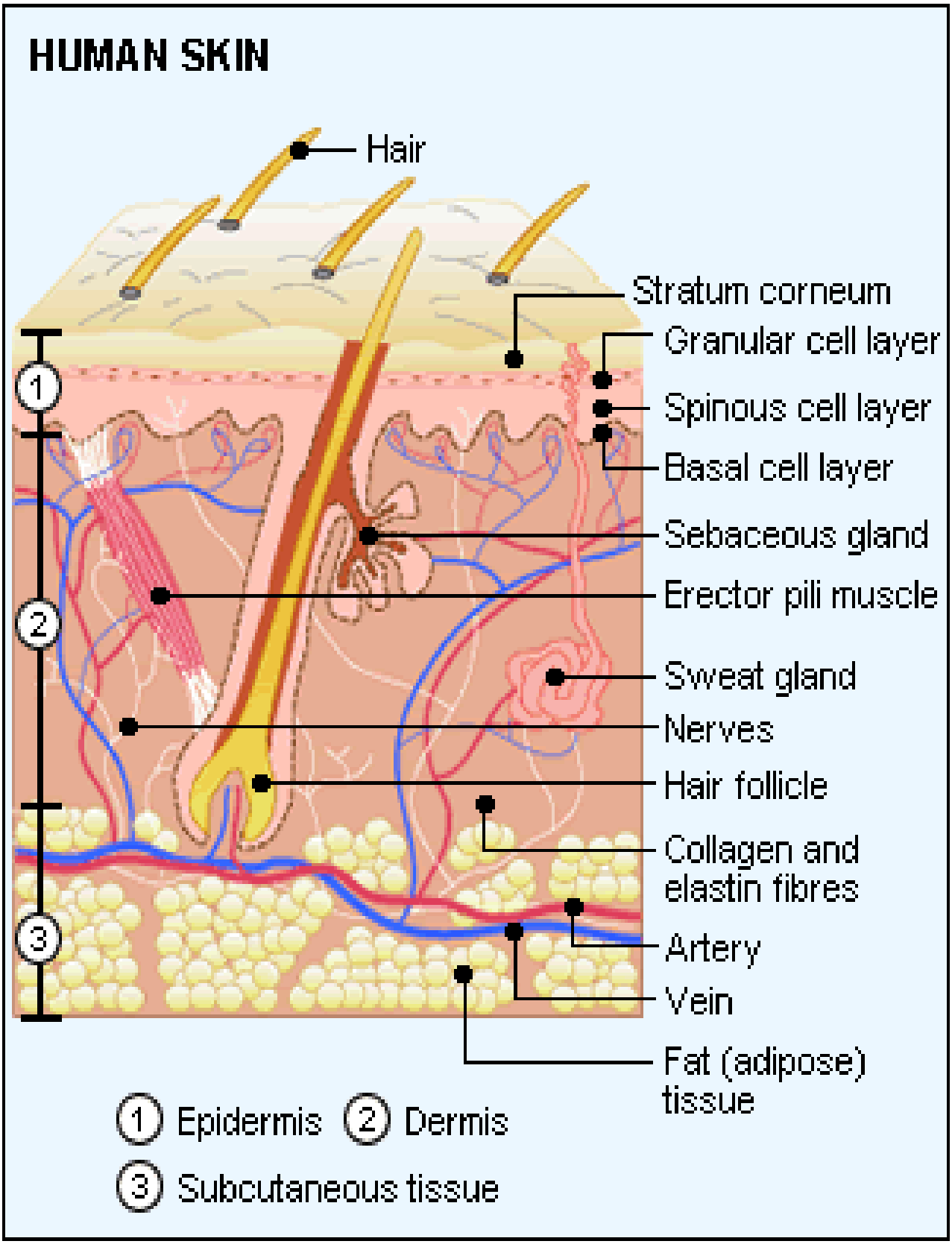
Explain to participants the need to understand the anatomy and physiology of the skin, the risk factors for pressure ulcer development and the process of tissue breakdown in hospitalized patients.

PRESENTATION:

Display the structure of the skin on a projector.

Brief Description: The skin is the body's largest organ .

The skin consists of layers: Epidermis, dermis, and the subcutaneous layer.


HUMAN SKIN
Hair
Stratum corneum
Granular cell layer
Spinous cell layer
Basal cell layer
Sebaceous gland
Erector pili muscle
Sweat gland
Nerves
Hair follicle
Collagen and elastin fibres
Artery
Vein
Fat (adipose) tissue
1
2
3
1 Epidermis
2 Dermis
3 Subcutaneous tissue

Epidermis: This is the outermost layer of the skin. It is a thin avascular (without blood supply) structure consisting of outer dead cornified portion that serves as a protective barrier. There is a deeper living portion that folds into the dermis. The epidermis is nourished by blood vessels in the dermis. Basically the epidermis provides a protective, water-proof barrier and resist changes in PH and temperature.

Basement membrane: Also referred to as the epidermal-dermal junction, separates the dermis from the epidermis. It anchors the epidermis to the dermis and is important for elasticity and tensile strength. When a blister forms, this membrane is typically the area that has been damaged.

Dermis: Is the inner supportive layer which consist mostly of connective tissue or collagen. Collagen is the tough fibrous protein that enables the skin to resist tearing. The dermis allows resilient elastic tissue which permits stretch of the skin during body movement. The nerves, sensory receptors, blood vessels and lymphatic lay in the dermis. Other appendages of the epidermis like the hair follicles, sebaceous glands and sweat glands are embedded in the dermis.

Subcutaneous layer: This the adipose tissue which is made up of lobules of fat cells. It is the layer of fat below the dermis. It stores fat for energy, cushions and provides insulation for temperature control. It further provides a soft cushioning effect to the body.

Functions of the skin:

- Largest organ in the body
- Receives one-third of the body's circulating blood volume.
- Protects against heat, light , injury and infection
- Regulates body temperature and sense painful and pleasant stimulation
- Stores water, fat and vitamin D
- Varies in thickness depending on the location, from0.5mm in the tympanic membrane to 6mm on the palms of the hands and soles of the feet.

What is pressure ulcer?

A localized injury to the skin/or underlying tissue, usually over bony prominence, as a result of pressure, or in combination with shear and /or friction.

RISK FACTORS FOR SKIN BREAKDOWN:

- Immobility, inactivity and loss of sensory perception affect the duration and intensity of pressure. Low intensity of pressure over a prolonged period of time OR a high pressure intensity lasting for a short period.
- Friction : Rubbing of one surface against the other. Friction reduces tissue tolerance to pressure by abrading and damaging the epidermal and upper dermal skin.(Scemons & Elston 2009).
- A combination pressure combines with friction, ulcers develop at a low pressure levels.
- Friction in conjunction with shear contributes to ulcers in semi-fowlers position.
- Shear: Shear is the stress which occurs in a body under strain, consisting of in a movement of planes of a body that are parallel to a particular plane. Shear twist and stretches tissue and blood vessels at bony tissue interfaces and therefore affects deeper tissue structures and deep blood vessels. Semi-fowlers position is the most common cause of shear. This explains why many pressure ulcers over bony prominences are substantially larger than the bony prominence over which they occur. Gravity plus friction equals shear.
- Moisture: Moisture removes the protective skin oils thereby creating a more friable skin. Mild to moderate moisture causes increase shearing and friction force. Urinary incontinence exposes the skin to excess moisture and chemical damage. This risk is increased with fecal incontinence due to presence of bacteria and bowel enzymes.
- Elevated temperature : Especially in the elderly
- Extreme age .
- Malnutrition
- Incontinence(Urinary or fecal)
- Lack of pain perception
- Natural thinness or weight loss
- Smoking
- Co-morbidities : Diabetes mellitus, stroke,
- Decreased mental awareness.

PATHOPHYSIOLOGY OF PRESSURE ULCER

This involves risk factors highlighted above and decreased healing capacity of the tissues. These factors are responsible for increased shear stress, friction and pressure which are the fundamental factors in pressure ulcer development. Prolonged pressure induces a cyclic ischemic-reperfusion changes which play an important role in the formation of pressure ulcers. The ischemia – reperfusion model of tissue damage describes that damage initially occurs with hypoxia which is then exacerbated with the restoration of oxygen (reperfusion). The initial lack of oxygen causes production of toxic metabolites which depletes the cellular antioxidant defenses and the return of oxygen is accompanied by biochemical reactions that are normally controlled by antioxidants. Without the protection of antioxidants, additional tissue damage occurs. Explaining further on the ischemia –reperfusion model, Bliss (1993) holds that the sudden increase in blood flow (reperfusion) maybe as much as 30 times the resting value culminating in the bright red flush often noted and referred to as reactive or blanching hyperemia (normal response). In as little as five seconds of external pressure, a physiological reaction can be provoked that may be one third or three quarters of the period of ischemia. If the lymphatic vessels of the dependent tissue remain intact and excess interstitial fluid is removed, it is believed that permanent tissue changes will not progress. However, when local defenses against free radicals are lost, oxidative damage can occur directly under ischemic skin due to free radical interaction with protein and lipid membranes in the fat –containing subcutaneous layer. Cellular damage can spread in a chain reaction fashion to tissues around and below the initial site of damage, resulting in the typical tissue loss commonly seen in pressure ulcers. In addition to the direct damage, excess free radicals also act as a trigger for cell signal for inflammatory cells which further adds to tissue loss. The combination of these events initiates rapid pressure ulcer development.

Blanching hyperemia is described as the distinct erythema caused by reactive hyperemia which when light pressure is applied will blanch, indicating that the patient microcirculation is intact. Nonblanching hyperemia (an abnormal physiological response) is detected when the color of the erythema remains upon light finger pressure, indicating disruption in the microcirculation. Further examination of erythema should include the following steps:

- Applying light pressure to the area for 10 seconds. Upon releasing the pressure, if the area is white and then returns to original color, the area possibly has adequate blood supply. However, observation should continue and preventive strategies should be

implemented. If the area remains the same without change in color as before pressure was applied, it is an indication of beginning tissue damage. Preventive strategies should be implemented. Furthermore, if there is alteration in skin color (redness, purple, black), increased heat or swelling, this may indicate underlying tissue breakdown. In such situation more frequent nursing assessment should be advocated. Areas of localized heat, damage or coolness, purple or black discoloration, localized edema and indurations indicate pressure ulcer development in a dark pigmented individual.

Often other clinical signs such as blistering, indurations, and edema are associated. It should be noted that the vessels in the subcutaneous tissue also give rise to the perforators that also supply the skin, and so the deep vessel obstruction is likely to result in both cutaneous and subcutaneous ischemia if the period of occlusion is sustained. Additionally, if tissue collagen level is not depleted, this helps to prevent disruption to the microcirculation by buffering the interstitial fluid from external pressures, thereby maintaining optimum hydrostatic pressure.

STAGING OF PRESSURE ULCER: The National Pressure Ulcer Advisory panel (NPUAP, 2009) staging system.

Suspected Deep Tissue Injury: A purple or maroon localized area of discolored intact skin, or blood –filled blister due to damage of underlying soft tissue from pressure and /or shear. The area may be preceded by tissue that is painful, firm, mushy , boggy, warmer or cooler as compared to adjacent tissue.

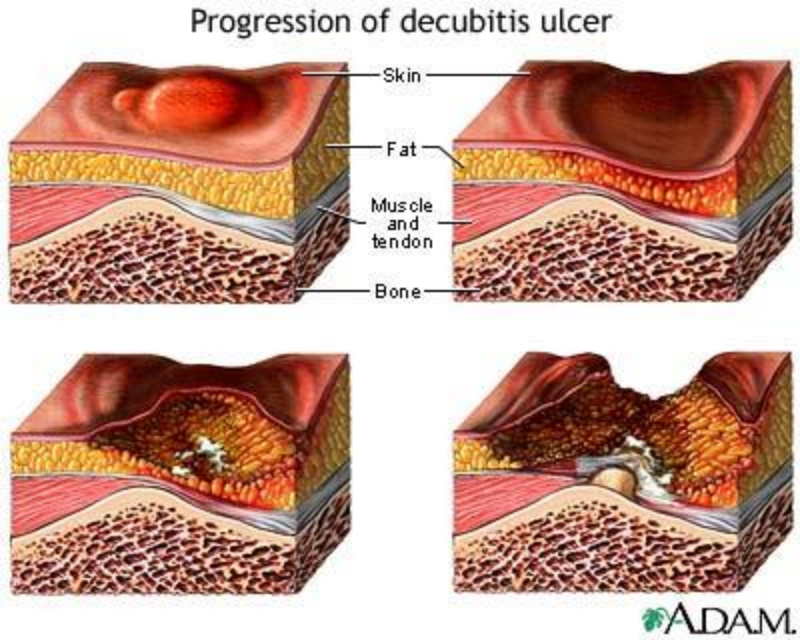
In the dark skin tones, evolution of deep tissue injury may include a thin blister over a dark wound bed. The wound may further evolve and become covered by thin eschar. Note figure 1 below.

C

Figure 1. Deep tissue injury

Stage I : Intact skin with non-blanchable redness of a localized area usually over bony prominence. In dark persons, the color differs from surrounding or adjacent skin. Figure 2.

Figure 2. Stage 1.

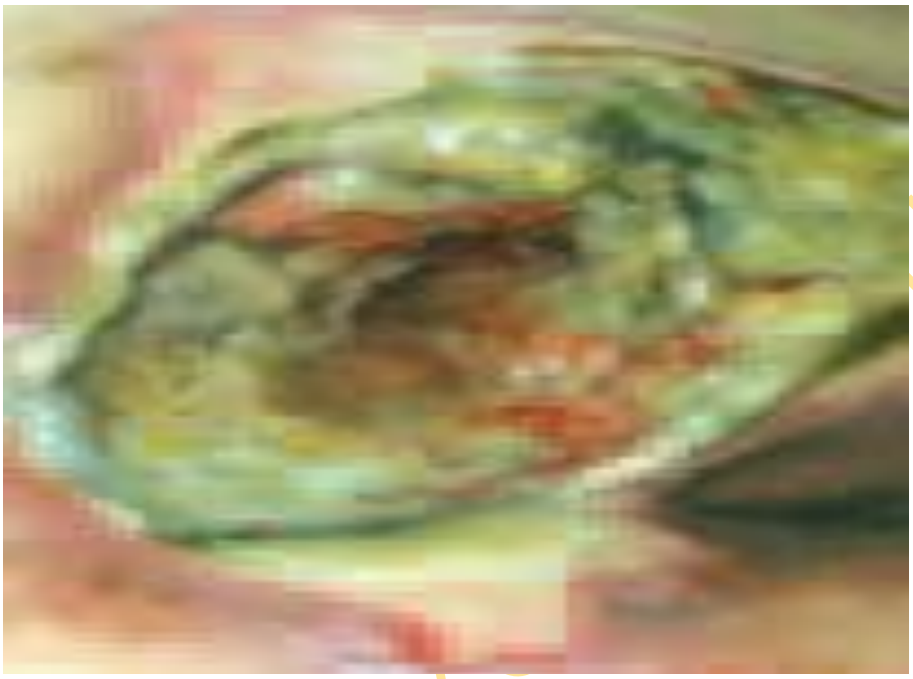


Stage II: Partial thickness loss of dermis presenting as a shallow open ulcer with a pink wound bed, without slough. May also present as an intact or open/ruptured serum filled blister. Stage II can also present as a shiny or dry shallow ulcer without slough or bruising. Bruising indicates suspected deep tissue injury.

Stage III : Full thickness loss tissue loss, with exposure of subcutaneous fat . Bone, tendon or muscles are not exposed. Slough maybe present but does not obscure the depth of tissue loss. May include undermining and tunneling. Note that the depth of stage III ulcers varying depending on the anatomical site. For example, the bridge of the nose, ear, occiput and malleolus do not have subcutaneous tissue, therefore stage III ulcers can be shallow. In contrast, areas of significant adiposity can develop extremely deep stage III pressure ulcers. Bone/tendon is not visible or directly palpable.

Stage IV: Full thickness tissue loss with exposed bone, tendon or muscle. Slough or eschar may be present on some part of the wound bed. Often include undermining and tunneling. Stage

IV can extend to supporting structures: fascia, tendon or joint capsule, making Osteomyelitis possible. Exposed bone /tendon is visible or palpable.



Stage III ulcer covered with slough. Figure III

Unstageable: Full thickness tissue loss in which the base of the ulcer is covered by slough (Yellow, tan, grey or brown) and /or eschar (tan, brown or black) in the wound bed. Until the slough and/or eschar is removed to expose the base of the wound, the true depth and therefore the stage cannot be determined. Stable (dry, adherent, intact without erythema or fluctuance) eschar on the heels serves as 'the body's natural (biological) cover' and should not be removed.

Unstageable ulcer covered with stable dry eschar.

\

SESSION III: Module II

TOPIC: ASSESSMENT.

Objectives: At the end of this module, participants will be able to:

1. Understand the need for assessment of risk for pressure ulcer.
2. Describe the use of Braden scale for pressure ulcer prediction.
3. Interpret the Braden scale scores
4. Use the mini-nutritional scale to assess nutritional status.
5. Identify conditions that increase friction and shear

PRESENTATION:

- Introduction: Risk assessment is more than determining individual's numerical score. It involves identifying those risk factors that contribute to the score and minimizing those specific deficits.

1. **Skin inspection** : A head to toe inspection should be done on admission, focusing on high risk areas such as bony prominences. Five parameters for skin assessment are recommended: Skin temperature, skin color, skin texture/turgor. Skin integrity and moisture status (Centre for Medicare and Medicaid services (CMS) 2004, Armstrong 2008, WOCN, 2010)

- Blanching erythema is an early indication to redistribute pressure. Non –blanching erythema suggest that tissue damage has already occurred.
  (ICSI 2007). All skin change should be documented.
- Assess the intensity and duration of pressure on all bony prominences of at-risk individual on daily basis. Special garments, shoes, heel and elbow protectors, orthotic devices, protective sleeves should be removed for skin and bony prominences inspection.
- Assess for specific vulnerable pressure points for bed or chair bound individuals: Example : Supine position: occiput, sacrum , heels
  Sitting position: ischial tuberosities, coccyx
  Side –lying position: trochanters.

2. **Assess for immobility:** This is the most significant risk factor for pressure ulcer development. Patients with some degree of immobility needs frequent monitoring. Example, non-ambulatory, confined to bed, chairs, wheel chair, recliners, or couches for prolonged periods. Patient with paralysis and /or contractures, those with orthopedic

devices which limit function and range of motion. Patients who require assistance in ambulating, repositioning or getting out of bed or chairs.

3. **Assess for friction and sharing:** Friction is the mechanical force which occurs when two surfaces move across each other, damaging surface tissues and causing abrasion or blister. Individuals who cannot lift themselves during repositioning and transferring are at high risk for friction. Friction may disrupt the barrier function of the stratum corneum. Shear on the other hand is the mechanical force that is parallel rather than perpendicular to the skin, which damages deep tissues such as muscle. Tissues attached to the bone are pulled in one direction while surface tissues remain stationary. Shear commonly occurs when the head of the bed is elevated and the individual slides downwards (WOCN 2010). Shear forces at the interface between the body and support surfaces can aggravate tissue damage already caused by other sources. (NPUAP/ EPUAP 2009).
4. **Assess for incontinence:** Risk factors for fecal and urinary incontinence include: female sex, older age, neurogenic disease (including stroke), increased body mass, decreased physical activity, depression, and diabetes. High risk groups for fecal incontinence include: elderly, patients with GIT symptoms and disorders, obstetric factors such as episiotomy, and the sequelae from those that have undergone surgical procedures involving the bowel or other areas in the pelvis. (Norton, Whitehead, Bliss & Lang 2009).

There is need to differentiate between pressure ulcers and moisture lesions caused by incontinence from urine/ feces (Incontinence associated dermatitis {IAD}). Assessment parameters to establish the difference between IAD and pressure ulcers include: Location, color, depth of wound, and the tissue type.

Table 1. **Differences between incontinence associated dermatitis and pressure ulcer**

Assessment parameters	**IAD**	**Pressure ulcers**
Location	Diffuse, in skin folds	Over bony prominences
Color	Red to bright red	Red to bluish/ purple
Depth	Partial thickness	Partial to full thickness
Necrosis	None	May be present
Symptoms	Pain and itching	Pain and itching

Table showing difference between incontinence associated dermatitis and pressure ulcer (Gray et.al 2007)

5. **Assess nutritional status:** Use a valid and reliable tool for nutritional screening: Mini-Nutritional Assessment (MNA) tool. Early nutritional assessment is critical to identify the risk of under-nutrition such as deficiency of protein. (Doner, Posthauer & Thomas, 2009). Nutritional assessment should be completed on admission and where there is a change in the patients' condition that increases the risk for under nutrition. (Whitney, 2006). Parameters to include in the assessment include: Current weight and usual weight, history of unintentional weight loss or gain, body mass index (BMI), protein energy malnutrition, food intake, dental health, oral and GIT history including chewing and swallowing difficulties, ability to feed oneself, medical or surgical interventions , which influence nutrient intake or absorption of nutrients, drug / nutrient interaction, psychological factors affecting food intake e.g ability to obtain food, cooking facilities, food preferences, cultural lifestyle influencing food selection, advanced age.

   Laboratory parameters for nutritional status such as serum albumin levels is a poor indicator of protein status. This is because multiple factors decrease albumin levels even when protein intake is adequate. These conditions include infection, acute stress, surgery, excess cortisone, dehydration (Dorner et.al 2009). Serum albumin is also not a sensitive indicator of the effectiveness of interventions, due to its 20-day half-life. Prealbumin with a short half-life of 2-3dys is a more current reflection of protein stores. However, low prealbumin (transthyretin and thyroxin-binding albumin) levels may indicate metabolic stress and inflammation, and may be within normal levels during states of malnutrition. Therefore it is not recommended as the sole marker for nutritional status. Laboratory evaluation should form part of the nutritional assessment process and not considered in isolation.

Mini- Nutritional Assessment (MNA)

Last name First name----------

Sex Age weight(Kg) HT (cm) Date ----

Complete the screen by filling the boxes.

A. Has food intake declined over the past 3 months due to loss of appetite, digestive or swallowing difficulties? 0= severe decrease in food intake 1= moderate decrease in food intake 2=no decrease in food intake	
B. Weight loss during the last 3 months. 0= weight loss greater than 3kg (6.6Ibs) 1= does not know 2 weight loss between 1 and 3kg (2.2-6.6Ibs) 3= no weight loss.	
C. Mobility. 0= bed or chair bound 1=able to get out of bed or chair but does not go out. 2= goes out.	
D. Has suffered psychological stress or acute illness in the past 3 months. 0= yes 2= no	
E. Neuropschological problems. 0 = severe dementia or depression 1= mild dementia 2 = no psychological problems	
F1. Body Mass Index (BMI) Wight in Kg/ height in m^2 0 = BMI less than 19 1= BMI 19 to less than 21 2= BMI 21 to less than 23. **If BMI is not available, replace F1 with question F2. Do not answer F2 if F1 is already available.*	
F2. Calf circumference (CC) in cm 0= CC less than 31 3= CC 31 or greater.	
Screening score (Max score 14 points) **12-14 : Normal nutritional status** **8-11 At risk of malnutrition** **0-7 points: malnourished.**	

Adopted from WOCN guideline for prevention and management of pressure ulcers. (2010).

BRADEN SCALE FOR PREDICTIING PRESSURE SORE RISK

Patient's Name_____ Evaluator:_____ Date of Assessment----------

• **SENSORY PERCEPTION** • Ability to respond meaningfully to pressure-related discomfort	**1. Completely Limited** Unresponsive (does not moan, flinch or grasp) to painful stimuli, due to diminished level of consciousness or sedation OR Limited ability to feel pain all over most of body	**2. Very limited** Respond only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness OR Has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body	**3. Slightly Limited** Responds to verbal commands, but cannot or the need to be turned. OR Has some sensory impairment which limits the ability to feel pain or discomfort in 1 to 2 extremities.	**4. No impairment** Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.				
MOISTURE Degree to which skin is exposed to moisture	**1. Constantly Moist** Skin is kept moist almost constantly by perspiration, urine etc. Dampness is detected every time patient is moved or turned.	**2. Very Moist** Skin is often, but not always moist. Line must be changed at least once a shift	**3. Occasionally Moist** Skin is occasionally moist, requiring An extra linen change approximately once a day	**4. Rarely Moist** Skin is usually dry, line only requires changing at routine intervals				
ACTIVITY Degree of physical activity	**1. Bedfast** Confined to bed	**2. Chairfast** Ability to walk severally limited or non-existent. Cannot bear own weight and/or must be assisted into chair or wheelchair	**3. Walks Occasionally** Walks occasionally during the day, but for very short distances, with or without assistance. Spends majority of each shift in bed or chair	**4. Walks Frequently** Walks outside room at least twice a day and inside room at least once every two hours during waking hours				
MOBILITY Ability to change and control body position	**1. Completely immobile** Does not make even slight changes in body or extremity position without assistance	**2. Very Limited** Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently	**3. Slightly Limited** Makes frequent though slight changes in body or extremity position independently	**4. No Limitation** Makes major and frequent changes in position without assistance				
NUTRITION Usual food intake	**1. Very Poor** Never eats complete meal. Rarely eats more than ½ of any food offered. Eats 2 servings or less protein (meat or dairy products) per day. Takes fluid poorly. Does not take a liquid dietary supplement. OR Is NPO and/or maintained on clear liquids or IV's for more than 5 days	**2. Probably inadequate** Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 serving of meat or dairy products per day. Occasionally will take a dietary supplement. OR Receives less than optimum amount of liquid diet or tube feeding	**3. Adequate** Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy product) per day. Occasionally will refuse a meal, but will usually take a supplement when offered OR Is on a tube feeding or TPN regimen which probably meets most of nutritional needs	**4. Excellent** Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.				
FRICTION & SHEAR	**1. Problem** Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction	**2. Potential Problem** Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down	3. No apparent Problem Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair.					

Risk assessment should be performed on admission and repeated on a regular scheduled basis (every 24-48hrs), or when there is significant change in the client's condition, such as surgery or a decline in health status.

- *Introduce BRADEN scale for predicting pressure ulcer: Measure the levels of risk. Provide a description of the scale and project on a power point.* ***Mild risk: Braden Score: 15-18, Moderate risk: 13-14, High risk : 10-12, Very high risk : 9 and below.***

MODULE III : PREVENTIVE STRATEGIES/ INTERVENTIONS

Objectives :

At the end of this module, participants will :

1.Describe the positioning standards to prevent pressure ulcers in at –risk patients.

2. Explain the methods to minimize shear and friction

3. Identify the different types of support surfaces

4. Describe the basic interventions for skin care

5. Explain strategies to improve nutritional deficiencies

Presentation:

1. **Positioning Standards and pressure redistribution** :

Frequent repositioning can help prevent capillary occlusion, which leads to tissue ischemia.

- Reposition every 2hrs. However, the frequency of repositioning depends on capillary-closure pressure, which varies in individuals and the pressure points. So turning should be individualized.
- Use the rule of 30^0 side-lying and **NOT** lateral position. This avoids pressure on trochanter and coccyx. The patient's hips and shoulders are tilted 30^0 from supine, which prevents pressure over the trochanter and sacrum. If the head of the bed is elevated beyond 30 degrees, the duration should be limited to minimize shear forces and pressure.
- Pillow bridging should be placed:
  - Under the legs to elevate the heels off any surface or mattress

- Between the ankles
- Between the knees
- Behind the back
- Under the head supporting the neck
  - Active and passive range of motion exercise.
  - **DO NOT USE** donuts or rings cushions. The cushion can actually cause pressure related tissue damage in some instances(JBI 1997, Templeton 2004)
  - **Do NOT MASSAGE** the affected area as this may cause tissue damage .(Scemons & Elston 2009)

- Post a repositioning clock to remind others about repositioning.

  NOTE: *Repositioning frequency should be determined by individual, activity/mobility level, and the overall medical condition. In some patients, regular turning and repositioning may not be possible because of their medical condition. Consideration should be given to upgrade the support surface for such individuals. (NPUAP/ EPUAP 2009)*
- *Note that repositioning does not always entail a full turn from left to right or from back to left side. It may also be helpful to intervene with small frequent position changes using pillows, bath blankets, and wedges to relief pressure. These changes expand the weight-bearing surface by molding to the body and minimizing point pressure.*
- For chair bound patients, pay attention to the anatomy, postural alignment, distribution of weight and support of feet. A small shift may be easy by elevating the legs. Encourage standing and reseating to interrupt the increase in pressure from the duration and gravity that occurs over time. If patients can reposition themselves, encourage them to do chair push-ups at 15 minutes intervals.
- **Heels:** The heels are the second most common site for pressure ulcer development after sacrum. This is because the heels have small surface areas and underlying bone surfaces therefore redistribution of pressure is nearly impossible. Heels also have lower resting blood-perfusion levels, and this is compounded in many elderly patients with compromised lower-extremity blood flow. A brief change in mobility may increase the risk for heel ulcer development. Therefore it is important to initiate early preventive activities to reduce the interface pressure under the heels.

- *The most effective intervention is a total 'off –loading' of the heel by elevating the lower extremities with pillow.*
- *Pillows under calves decrease heel interface pressures, as well as foam cushions under the calves (Cadue, Karolewicz, Tardy, Barrault, Robert & Pourrat 2008).*
- Longitudinal placement of pillow under the calf is recommended, with heel suspended in the air. Note that pillows do not prevent plantar flexion contracture or lateral leg rotation (Fowler, Scot-Williams, and McGuire 2008). Foam mattresses reduce the risk of heel pressure ulcers significantly, when compared to standard hospital mattresses. (Nicosia, Gliatta, Woodbury & Houghton 2007)
- Do not allow too tight linens at the foot of the bed in order to reduce pressure on the heels. Loosen the sheets at the foot of the bed when assisting patients back to bed or use a foot cradle.
- One should not overlook the effect of patients' gown and under -pads and lift sheets. If wrinkles occur under the patient and are not removed, these folds will cause pressure on the skin and will result in the beginning of pressure ulcer.
- Fluid –filled gloves and bags: No evidence to support the use of these devices. (Collier, 2001) and therefore should not be encouraged.

2. **INTERVENTIONS TO PREVENT AND TREAT FRICTION .**

- Skin sealants and skin barriers (alcohol or non-alcohol based)
- Moisturizers and skin lubricants
- Elbow and heel protectors
- Protective thin hydrocolloid or transparent dressing can reduce friction.
- Sprinkle corn starch on the bed linens (NEVER TALCUM POWDER). Talcum powder may cause skin abrading
- Repositioning techniques

3. INTERVENTIONS TO PREVENT AND TREAT SHEAR.

- 30^{o} head elevation for short periods of time. To prevent the patient from sliding down in bed.

- Semi-fowlers bed position is most common cause of shear
- Use foot boards.
- Use knee gatch or the foot of the bed slightly to prevent patient from sliding downwards. (Check with the physicians for any contraindication)
- Use lift sheets with repositioning to reduce dragging of body surfaces with position change
- Heel protection by actually elevating the heel off the mattress. (Not with foam, water gloves or dressings)
- Appropriate repositioning.
- **Avoid massaging bony prominences.**

4. MANAGEMENT OF TISSUE LOAD: STATIC SUPPORT SURFACES.

A support surface redistributes pressure to prevent ulcers, reduce shear and friction. These surfaces can be classified in different ways:

1 preventive or therapeutic,

2 Forms (Wheelchair, mattress replacement, specialty beds, operating table,)

3 Power source (powered or dynamic, or non-powered,

4 medium (gel, foam, air, water) .

The choice of support surface is the corner stone for pressure ulcer reduction. The purpose of these products is to reduce 'interface pressure', which is the force that acts between the body and the support surface, and it is primarily affected by the composition of the body tissue, the stiffness of the support surface, and the characteristics of the patient's body. Support surfaces maximize contact and redistribute weight over large area. Many of these surfaces also reduce friction and shear as well.

Interphase pressure quantifies the intensity of pressure being applied externally to the skin, which commonly exceeds the capillary pressures. Use pillows or foam wedges to keep bony prominences from direct contact. Devices that totally relieve pressure from the heels should be used.

The support surfaces to be used in this study are static overlays. They are placed on top of existing mattress and do not require pumping. Static overlays are indicated for patients at low to moderate risk of pressure –related tissue damage (Templeton, 2004). The

effectiveness of static devices is dependent on their ability to deform and mould to the client body shape ('envelopment'), thereby transmitting high pressure to areas of low pressure. A thick foam overlay (10cm) will provide a better pressure redistribution than a thin foam overlay.

The standard hospital bed is considered outdated because it is associated with high incidence of pressure ulcers. The foam ring 'donuts' are also outdated because they concentrate the pressure intensity on the surrounding tissue. When choosing a foam mattress, The choice should be based on the understanding of the characteristics of foam in the context which include: height, density, indentation load deflection (ILD) and contours.

Base height: measures foam from its base to where the convolution begins- not to the peak of the convolution. The base height should be 4 inches.

Density: The weight per cubic foot. It measures the amount of foam in the product and reflects its ability to support the patient's weight. The recommended density is 1.3 to 1.6 Ibs per cubic foot.

ILD : measures the firmness of the foam and it is determined by the number of pounds needed to indent it to a depth of 25% with a circular plate. (In a 4inch foam, the ILD will measure the number of pounds needed to make a 1inch indentation.) ILD indicates the ability of the foam to distribute mechanical load. (Clay, 2008). It measures the surface feel of the foam which is not the same as firmness. It rather relates to comfort. The goal is to have a low ILD. Approximately 30 pounds is recommended. Ratio of conformability and support is needed. Recommendation is 60% ILD: 25% ILD is needed. (If 30 pounds makes 1" depression, then 75 pounds would be needed to make 2.4 inch depression in the same foam).

'**Bottoming out'** describes a situation in which the pressure –reducing surface does not provide adequate support. This occurs when the client's body weight causes the bony prominence to sink to the bottom of the device.

To check for this problem, place a palm under the mattress or cushion that is below the area at risk of a pressure ulcer. You should feel at least 1 inch of support material between your hand and the portion of the 'at risk' skin. If you feel less than 1 inch, there is inadequate pressure reduction, and the patient has 'bottomed out.' Other measures of the

effectiveness of the support surface are enveloping and immersion. (Scemons and Elsten 2009)

Enveloping is the ability of the support surface to conform, fit, or mould around irregularities in the body and immersion describes the depth of penetration (sinking) into a support surface.

5. **SKIN CARE AND INCONTINENCE MANAGEMENT.**

Moisture from perspiration, wound exudates and incontinence cause maceration of the skin, and weakens collagen fibres thereby decreasing the skin's resilience to stressors such as friction , shear and bacteria. However, fecal incontinence is a greater risk factor than urinary incontinence, due to bacterial component of feces which are caustic to the skin. (Clay 2008)

Skin integrity is degraded with poor hygiene and extreme moisture, where too much moisture results in skin maceration while too little results in dry skin, which is susceptible to cracking. A preventive skin care program for patients with urinary and fecal incontinence which is based on the principle of ' cleanse, moisturize and protect' is recommended. These are summarized as follows:

- Cleanse skin gently at each time of soling
- Establish a bladder / bowel management and retraining program for the patient.

- Use incontinent skin barriers such as creams, ointments, paste, and film forming skin protection and maintain intact skin. Dimethicone, liquid clear film barrier, petroleum or zinc oxide is recommended for individuals with frequent fecal and /or urinary incontinence to protect from IAD. (Beeckman,Schoonhovan et.al . 2009). Although soap and water have been used traditionally, evidence (Lewis-Byers, Thayer 2002) suggest that it impacts unfavorably to the skin PH balance. Therefore other cleansers containing surfactant is suggested to provide better protection for the skin.

- Combined products is suggested to serve time and make providing perineal care easier for the care giver. Combined products include moisturizing cleansers, moisturizer skin protectant creams, and disposable wash clothes that incorporate cleansers, moisturizers and skin protectant into a single product.

- Select underpads , or incontinent pants that are absorbent to wick incontinence moisture away from the skin versus trapping the moisture against the skin. Briefs are not recommended for fecal incontinence management because of increased risk of IAD. An "open' system, whereby an absorbent pad is placed under the patient to wick away moisture is recommended. (Clay 2008). This is preferable because normal perineal skin, which has a pH (5.5) has a tendency to become alkaline when exposed to incontinence and increased the risk of dermatitis. Advantages of an open system include cost containment, time to air out the skin, and help in maintaining normal skin pH. Patients' preference should also be considered.

- Use a pouching system or fecal or bowel containment device to contain excessive stool and to protect the skin from the effluent. (Wishin, Gallgher & McCann 2008)

- Institute a bladder program (Intermittent catheterization, Indwelling catheter, condom external device for men

6. CORRECTING NUTRITIONAL DEFICIENCIES.

Management of nutritional deficiency must incorporate patient's preference, special and needs . Follow the nutritional assessment to identify presence of malnutrition.

Encourage family support and follow hospital policy for supply of adequate meal.

Discuss with the physician if unable to take orally and plan for alternative method.

Module IV: PATIENT AND FAMILY EDUCATION.

Objectives: At the end of this module, participants will:

1. Understand the importance of family-centered approach to care
2. Understand the role of patient education in pressure ulcer prevention.

Presentation:

Educate patient and care giver about the causes and risk factors for pressure ulcer development. The importance of the following should be emphasized: performing regular inspection of skin over bony prominences. (Individuals can use mirror where necessary to examine own skin. Look for signs of pressure (changes in skin color, change in skin temperature,

(either warmer or cooler) compared to surrounding skin, change in skin texture such as bogginess or indurations.

- If skin changes are present, then offload pressure to the area and recheck in 15minutes.
- Continue to monitor until skin changes resolves or notify the nurse if changes does not resolve.
- Follow appropriate skin regimen
- Keep the skin clean and dry
- Use mild soap and warm water (not hot)
- Apply skin moisturizers such as petrolatum after bathing and when skin is dry.
- Use measures to reduce friction such as lifting instead of dragging across the bed
- Routinely turn , reposition and use pressure- redistributing devices if confined to bed
- Avoid use of ring, or donut-type devices
- Maintain adequate nutrition and fluid intake
- Monitor for weight loss, poor appetite and GIT changes that interfere with eating.
- Report changes promptly (Registered Nurses Association of Ontario (RNAO), 2005, NICE 2005, Stechmiller et.al 2008.)

MODULE V: DOCUMENTATON.

At the end of module V , participants will be able to:

1. Explain the importance of appropriate documentation of plan of care
2. Ensure communication of care within the interdisciplinary team
3. Describe the use of Braden scale and documentation
4. Describe the position schedule and its monitoring.

Presentation:

Explain the different methods of documentation in nursing

Initial recording and progress records of assessment findings

Show sample charts for pressure ulcer monitoring : Braden Scale, Mini- nutritional Assessment scale (MNA).

Appendix V

PRESSURE ULCER RISK ASSESSMENT AND PREVENTION RECORD.

PATIENT'S NAME:----------	**DATE OF ADMISSION**
HOSP. NUMBER:----------	**TIME OF ADMISSION**
Admitted From : Home ( ) OPD ( ) Another hospital ( )	
PRE-ADMISSION STATUS : Complete Immobility ( ) slight immobility ( ) incontinent : feces and/ or urine ( )	
If yes to any : State duration----------	

1. **Initial Risk Assessment (On Admission : within 6hrs)**

Do you consider this patient at risk for PU? Yes ( ) No ( )
Note: *Make the judgment based on the above and other risk factors.*

2. **Assess the level of risk : (BRADEN SCALE):** Braden Score: 15-18Low risk ( ) 13-14 Moderate risk ( ) 10-12 High risk ( ) < 9 Very high risk ( )

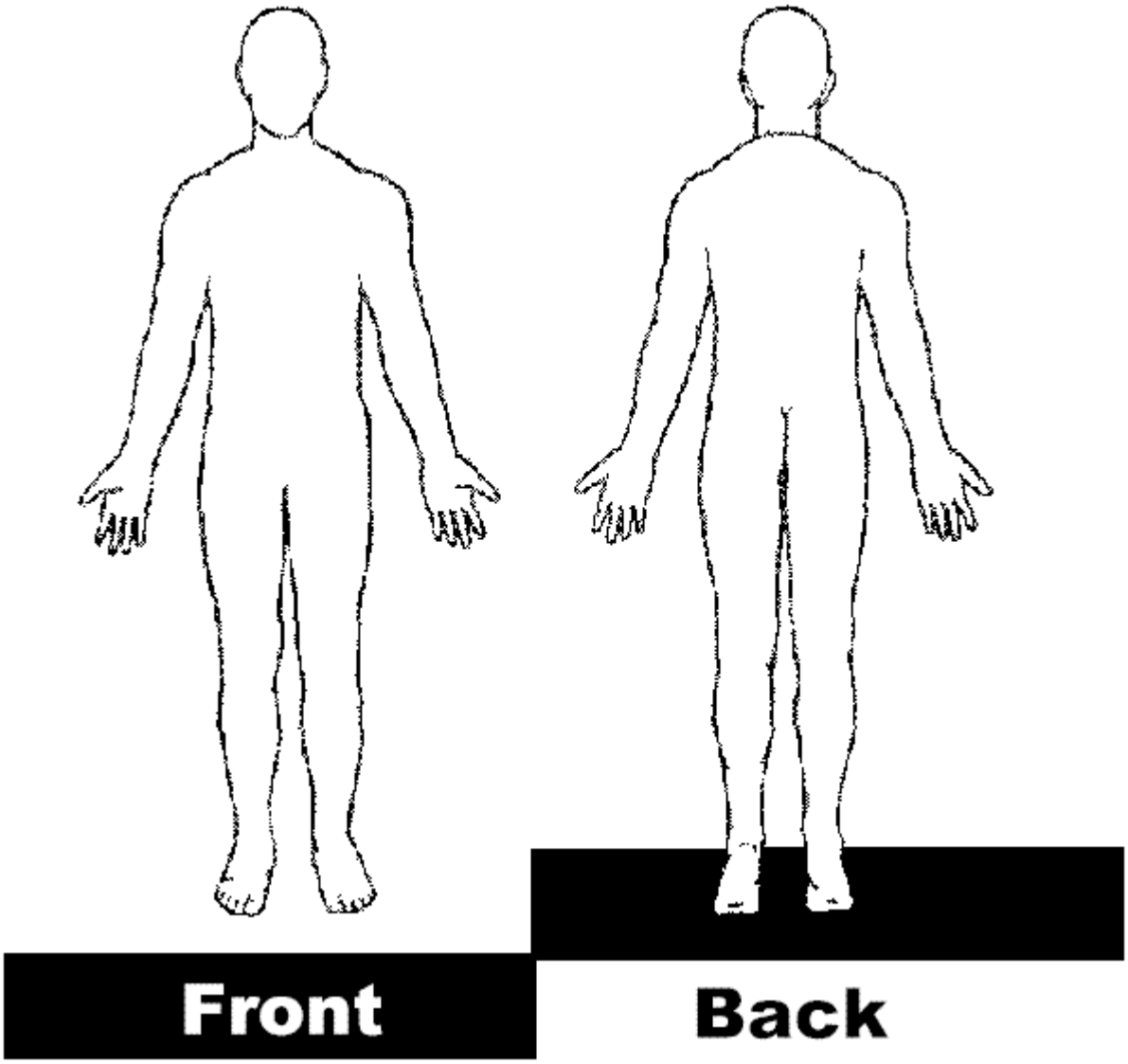
3. **Nutritional Assessment: Complete the Mini Nutritional Assessment Tool (MNA) .**

MNA Score: 12-14 normal nutritional status ( ) 8-11 at risk for malnutrition ( ) 0-7 malnourished ( )

4. **Skin Assessment: Inspect for the Following and comment briefly.**

localized indurations:
Non blanching hyperemia:
Discolored areas over bony prominences
Pain/ itching
Blisters
Localized heat
Localized edema
Localized coolness of the skin

5. **Pressure Ulcer Present On Admission Y ( ) N( )**
   If yes, place a mark (circle) on the body map



If yes, number of ulcers ……

Stage of ulcer 1( ) 2( ) 3 ( ) 4( )

Comment on Ulcer----------

Nursing diagnoses

1. ----------
2. ----------
3. ----------

PRESSURE ULCER PROGRESS SHEET (To be completed after initial assessment)

Mark X for" Yes", O for "NO" and NA for ' Not applicable'

Date →								
Shift →	**AM PM**	**AM PM**	**AM PM**	**AMPM**	**AMPM**	**AMPM**	**AMPM**	**AMPM**
Braden Risk Score								
Intact skin								
Moisture/Incontinence control • Foleys • External catheter • Pads/diapers • Barrier/lubricant								
Friction/shear Avoidance • Lift sheet for turning/transfer • Trapeze for repositioning. • Limit HOB elevation to 30° • Transparent thin foam dressing • Moisturizers/skin lubricant • Elbow/heel protector • Corn starch								
Pressure redistribution/ tissue load • 2hrly Turning schedule • Float heel with pillow • Foam wedges								

AM COMMENTS/NOTES----------

Name---------- **Sign**---------- **Rank**---------- **Date**----------**Time**---------

PM Comments: ----------

NAME---------- **Signature**---------- **RANK**----------. **DATE**----------. **TIME**----------

Appendix : **PRESSURE ULCER SCREENING RECORD**

PATIENT'S NAME: ---------- AGE----------. SEX---------HOSPITAL NUMBER----------

WARD----------. MEDICAL DIAGNOSIS---------- Date----------

NOTE: *Assess the parameters and assign pressure ulcer risk score using the Braden scale.*

BRADEN SCALE

Sensory perception: meaningful response to pressure – related discomfort	**1Completly limited:** (Unresponsive to painful stimuli or limited ability to feel pain	**2 Very Limited**: Responsive only to painful stimuli OR has sensory impairment	**3. slightly limited:** responds to verbal commands but can't communicate.	**4. No impairment:** responds to verbal commands. No sensory impairment.	Score
Moisture: Degree to which skin is wet	**1.constantly moist:** by perspiration, urine etc. dampness is detected every time pt is turned	**2 very moist:** skin is often but not always moist. Linen changed at least once per shift.	**3.ocassionally moist:** Linen change once per day.	4. **Rarely Moist:** skin usually dry. Linen change at routine interval.	
Activity: Degree of physical activity	**1 Bedfast:** Confined to bed	**2.chair fast:** Limited ability to walk, cannot bear own weight/ or must be assisted into chair/wheel chair	**3 Walks occasionally:** walks occasionally during day for very short distance, with or without assistance. Spends more time in bed	**4. Walks frequently:** Walks outside room at least 2ce dly or inside room at once every 2hrs.	
Mobility: Ability to change and control body position	**1completly immobile:** Does not make even slight changes in body or extremity position without assistance	**2. very limited:** occasional slight changes in body or extremity position but not independent frequent changes.	**3. slightly limited:** Makes frequent though slight changes in body or extremity position independently.	**4. No Limitations:** makes major and frequent changes	
Nutrition: Usual food intake pattern	**1 Very Poor:** Never eats a complete meal. Rarely eats more than ½ of any food offered. OR NPO.On IV fluids	**2.probably inadequate:** Rarely eats a complete meal. Generally eats only ½ of any food offered. OR on tube feeding	**3. Adequate:** eats over ½ of most meals. Eats a total of 4 servings of protein(meat, dairy product per day) Or on tube feeding which probable meets most nutritional needs.	**4 Excellent:** Eats most every meal. Never refuses meal.	
Friction/ Shear:	**1 Problem:** Requires moderate to maximum assistance in moving. Impossible to move without sliding.	**2.potential problem:** Moves feebly but requires minimum assistance. Skin probably slides to some extent against chair, sheets etc.	**3. No apparent problem:** Moves in bed or chair independently.		
Results	**15-18 Low risk. 13-14 moderate risk. 10-12 High risk. 9 and below: Very high risk.** ***If total score is 14 or less, initiate PU prevention Plan.***				

Mini- Nutritional Assessment (MNA)

Last name First name----------

Sex Age weight(Kg) HT (cm) Date ----------

Complete the screen by filling the boxes.

A Has food intake declined over the past 3 months due to loss of appetite, digestive or swallowing difficulties? 0= severe decrease in food intake 1= moderate decrease in food intake 2=no decrease in food intake	
B Weight loss during the last 3 months. 0= weight loss greater than 3kg (6.6Ibs) 1= does not know 2 weight loss between 1 and 3kg (2.2-6.6Ibs) 3= no weight loss.	
C **Mobility.** 0= bed or chair bound 1=able to get out of bed or chair but does not go out. 2= goes out.	
D Has suffered psychological stress or acute illness in the past 3 months. 0= yes 2= no	
E Neuropsychological problems. 0 = severe dementia or depression 1= mild dementia 2 = no psychological problems F1Body Mass Index (BMI) wt(kg)/ HTm^2 0= BMI less than 19. 1= BMI 19 to 21, 2= BMI 21 to less than 23. *NOTE: If BMI is not possible, replace F1 with F2. Do not complete both F1 and F2* **F2: Calf circumference (CC).** 0= cc less than 31. 3= CC 31 or greater. **Maximum score: 14. 12-14 normal nutritional status. 8-11 At risk for malnutrition. 0-7 malnourished.**	

Adopted from WOCN guideline for prevention and management of pressure ulcers. (2010).

WEEKLY ASSESMENT SHEET: PU RISK MONITORING RECORD

Pt Name ……..

To be completed after initial assessments. Hosp. number…….

Timing of assessments as per individual patient scores, but at least weekly

DATE	BRADEN Score	MNA Score	ACTION TAKEN +EQUIPMENT USED	REMARKS	SIGN

Appendix VI

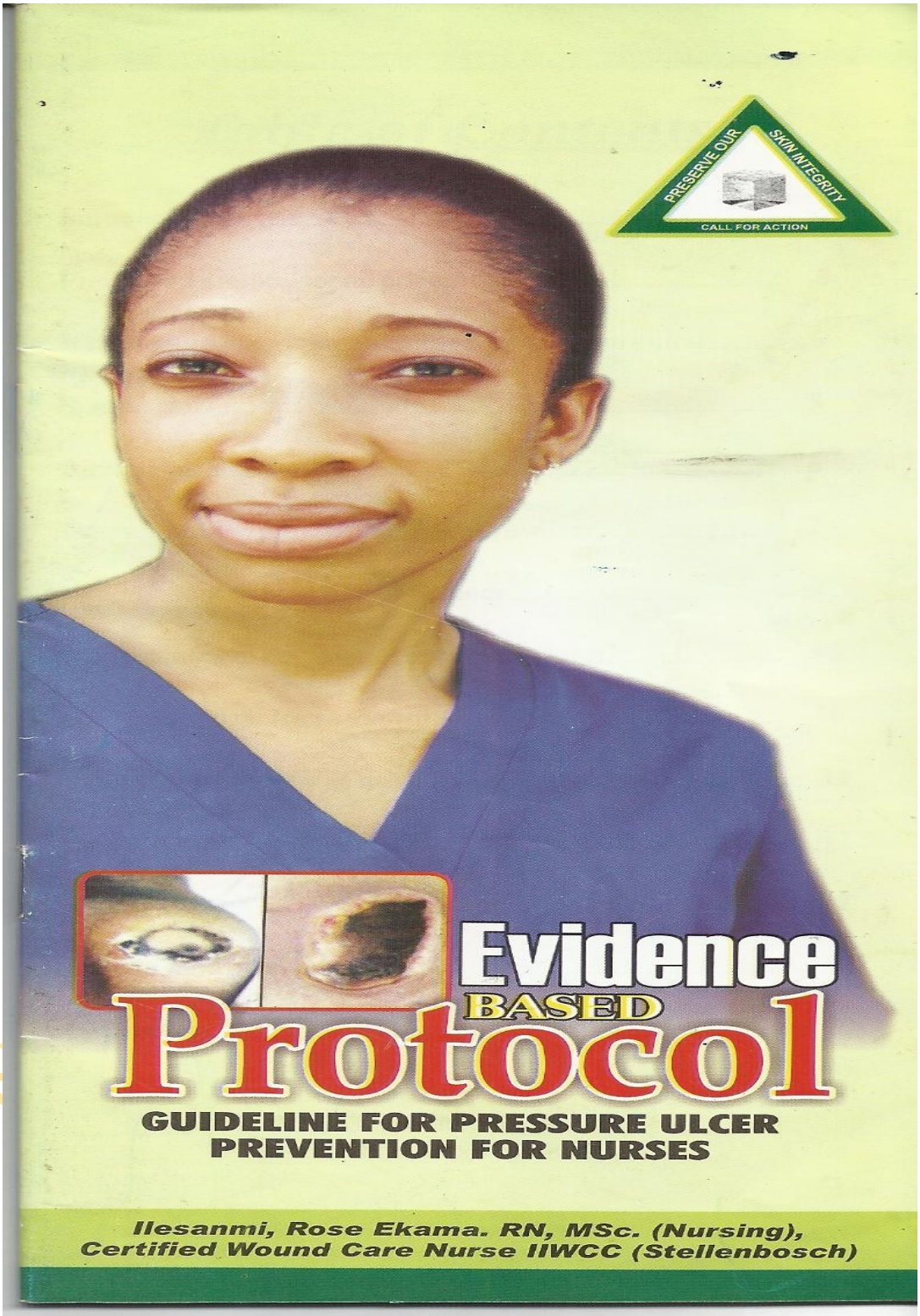

PRESERVE OUR SKIN INTEGRITY
CALL FOR ACTION
Evidence
BASED
Protocol
GUIDELINE FOR PRESSURE ULCER
PREVENTION FOR NURSES
Ilesanmi, Rose Ekama. RN, MSc. (Nursing),
Certified Wound Care Nurse IIWCC (Stellenbosch)

Table of Contents

Introduction

Pressure ulcer is a high cost health complication which prolongs hospital stay and affects the totality of patients wellbeing. It is largely a preventable problem.

International data indicated that in 2008, 13.5% prevalence rate was noted, of which 6% was facility acquired. In 2009, 13.3% prevalence rate was reported with 5% facility acquired rate (VanGilder et.al 2009).

In Nigeria there is paucity of national data on prevalence of pressure ulcers. However, clinical experience shows that it is common among spinal cord injured patients, incontinent and/or mobility compromised patients.

Hospital acquired pressure ulcer is considered a nursing - sensitive outcome which reflects the quality of care rendered to patients. Its prevention through routine risk assessment and implementation of evidence-based interventions is therefore a sin qua non for providing quality nursing care. Nurses have a vital role in preventing pressure ulcer development among hospitalized patients. This practice document is hoped to provide a guide and serve as a standard of care for nurses in preventing pressure ulcer development in hospitalized patients.

Objectives:

- To assist nurse clinicians to provide evidence-based care for pressure ulcer prevention in hospitalized patients.
- To provide a quick reference for nurses in clinical practice on pressure ulcer prevention
- To serve as a standard of practice for pressure ulcer prevention
- To provide a guide for continuing education for nurses on pressure ulcer prevention
- To provide direction for future nursing research on pressure ulcer prevention

1. Prevention protocol for all patients.

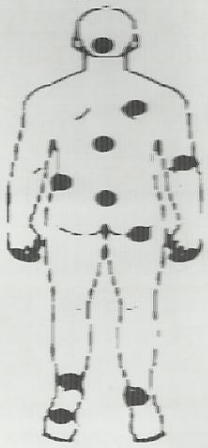
Assessment: Conduct visual and tactile assessment.

Identify at risk individuals based on extrinsic and intrinsic factors. Examples: Immobility, malnutrition, incontinent persons, neurological deficits, diabetes mellitus, unconsciousness, etc.

- ✷ Conduct initial risk assessment within 4 hours of admission using the Braden scale. (Appendix II).
- ✷ Reassess risk for pressure ulcer every 48hrs for patients at risk, and as condition deteriorates.
- ✷ Conduct a comprehensive skin assessment: Note localized temperature change compared to surrounding skin (warmer or cooler), edema, indurations, (skin hardness), Note skin integrity and moisture status.
- ✷ Note localized skin color change in areas under pressure, compared to surrounding skin.
- ✷ Note pressure damage on skin from medical equipment
- ✷ Assess for localized pain or area of discomfort on vulnerable pressure sites . Examples:
- — In Supine position: check occiput, sacrum, heels, elbows, scapular
- — Sitting position: check ischial tuberosities, coccyx.
- — Side-lying position: examine the trochanters.

Figure 1.

(a)

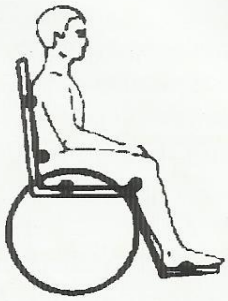


If the patient lies on his/her back

(b)

If the patient rests on his/her side

(c)



If the patient uses a wheelchair

- Assess for friction and shearing when lifting. Shear occurs when head of bed is elevated and individual slides downward .
- Assess for incontinence: Check risk factors for fecal and urinary incontinence in very old, neurologic and mobility compromised or depressed patients etc.

Differences between incontinence associated dermatitis (IAD) and pressure ulcer

Assessment parameters	IAD	Pressure ulcers
Location	Diffuse, in skin folds	Over bony prominences
Color	Red to bright red	Red to bluish/ purple
Depth	Partial thickness	Partial to full thickness
Necrosis	None	May be present
Symptoms	Pain and itching	Pain and itching

(Gray, M. 2007. In WOCN 2010)

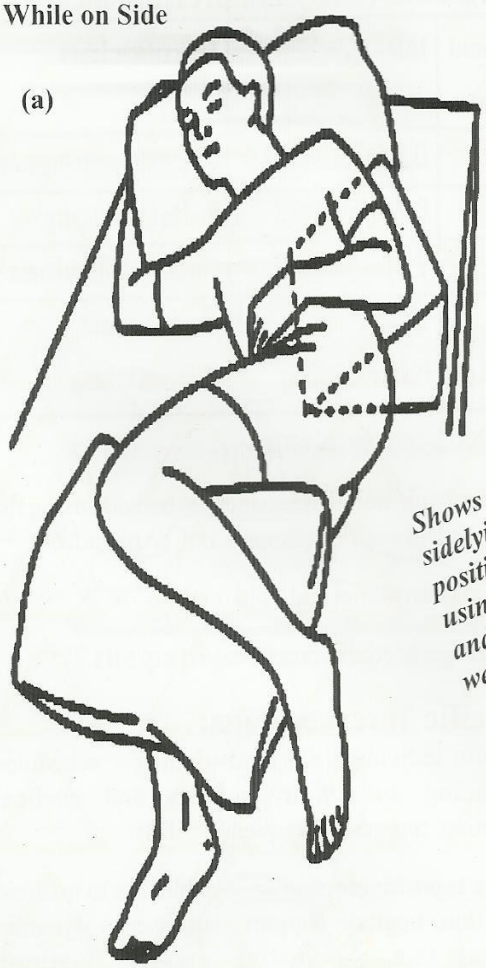
- Conduct nutritional assessment at bedside using the Mini-Nutritional Assessment tool. (Appendix I)
- Monitor nutritional and fluid intake.
- Encourage adequate nutrition

2. Specific Interventions:

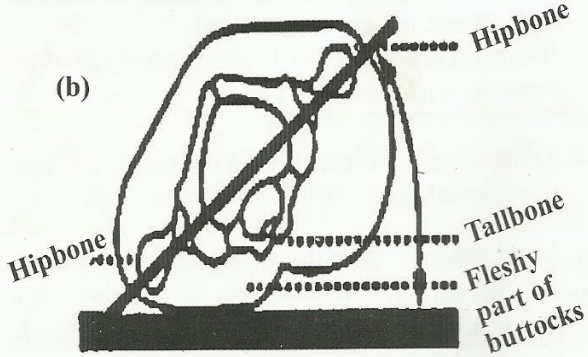
- Perform individualized repositioning schedules depending on activity/mobility and medical condition. Suggested frequency : 2hrly.
- Where repositioning is not possible due to medical condition, upgrade support surfaces to dynamic support (e.g. Alternating pressure mattress replacement, low air loss mattress).
  (low-air loss mattress is contra-indicated in patients with unstable spine)
- If foam support is used, avoid 'bottoming out' and ensure enveloping.
- Avoid pressure over the trochanter: Implement 30^{o} side lying and NOT lateral position. Tilt patient's hip and shoulders 30^{o} from the supine. (See figure 2 a&b)

Figure 2. Best Position While on Side

(a)



(b)



- Avoid high Fowlers position. If head of bed is elevated beyond 30°, the duration should be limited to minimize shear forces.

- ***Use pillow bridging:***
  - Under the legs to elevate the heels off any surface.
  - Between the ankles
  - Between the knees
  - Behind the back
  - Under the head supporting the neck

⚠ **DO NOT USE RING OR DONUT DEVICES.**

⚠ **DO NOT MASSAGE AFFECTED AREAS.**

NOTE: *Repositioning does not always entail a full turn from left to right or from back to left side.*

⚠ *Encourage small frequent shifts with pillows, foam wedges to expand the weight-bearing surface by molding to the body and minimizing point pressure.*

- **Interventions to prevent heel pressure ulcers:**
  - Elevate the lower extremities with pillow to 'off load' the heels. (Most effective intervention.) Figure 3b
  - Use pillows or foam cushions under calves to suspend the heel in the air. This decreases heel interface pressures.
  - Check heels frequently to ensure that as the pillows compress, they remain free of pressure.

* Maintain head of bed at or below 30° for all patients except medically contraindicated.
* Use foot boards to prevent foot drop
* Include interventions to prevent friction and protect heel as described above

✷ ***Management of tissue load: Support surfaces:***

* The goal is to redistribute pressure, reduce friction and shear.
* Choose surface with ability to deform and mould to client body shape(envelopment).
* A thick foam overlay (10cm) will provide a better pressure redistribution than a thin foam overlay.
* Avoid direct pressure on bony prominences. Pad between surfaces that may rub, such as knees.

✷ ***Skin care and moisture control:***

* Clean and dry skin after every incontinence episode.
* Apply urine and stool collection devices
* Apply skin barrier e.g Dimethicone (Cavilon 3M spray/ cream), Zinc oxide.
* Transparent films or hydrocolloids to bony prominences to reduce mechanical injury to the skin from friction

Further guidelines based on Braden scale score.

Braden Score: 15-18 Mild Risk

* Institute a turning schedule (2 hourly)
* Maximum remobilization
* Protect the heels
* Manage moisture, nutrition, friction and shear
* Pressure redistribution support surface if bed/ chair bound

If other major risk factors are present, consider next level of risk.

✷ **Braden Score 13-14: Moderate Risk**

* Turning schedule with 30° rule. Plus all interventions for mild risk.

✷ **Braden Score 10- 12: High Risk**

* More frequent turning and facilitate 30 degree lateral turns with foam wedges
* Supplement turning with small shifts.
* Plus all interventions for mild risk.

✷ **Very high risk (Less or equal to 9)**

* Consider static air overlay if adequate monitoring is possible.
* Consider use of low-air loss if additional risk factors are present OR severe pain is exacerbated by turning.
* Plus interventions for mild risk.
  Pressure relieve for special groups.

Intervention for special groups.

A. **Bariatric patients with large abdominal pannus.**

* Position in side lying.
* Lift pannus away from underlying skin surface using pillows or other offloading devices (NPAUP/EPUAP 2009).

B. **Acute Spinal cord injury patient:**

* More frequent turning than every 2hours due to microvascular dysfunction.

Appendix I.

Mini- Nutritional Assessment (MNA)

Last Name_____First Name_____

Sex_____Age____Weight(Kg)_____HT (cm)___Date_____

Complete the screen by filling the boxes.

	Score
A. Has food intake declined over the past 3 months due to loss of appetite, digestive or swallowing difficulties? 0= severe decrease in food intake 1= moderate decrease in food intake 2=no decrease in food intake	
B. Weight loss during the last 3 months. 0= weight loss greater than 3kg (6.6lbs) 1= does not know 2 weight loss between 1 and 3kg (2.2-6.6Ibs) 3= no weight loss.	
C. Mobility. 0= bed or chair bound 1=able to get out of bed or chair but does not go out. 2= goes out.	
D. Has suffered psychological stress or acute illness in the past 3 months. 0= yes 2= no	
E. Neuropsychological problems. 0 = severe dementia or depression 1= mild dementia 2 = no psychological problems	

F1. Body Mass Index (BMI) Weight in Kg/ height in m2 0 = BMI less than 19 1= BMI 19 to less than 21 2= BMI 21 to less than 23. *If BMI is not available, replace F1 with question F2. Do not answer F2 if F1 is already available. **F2. Calf circumference (CC) in CM** 0= CC less than 31 3 = CC 31 or greater.	
TOTAL SCORE	

Adopted from WOCN guideline for prevention and management of pressure ulcers. (2010).

Key

Screening Score:

Maximum Score 14

12 - 14	:	*Normal nutritional Status*
8-11	:	*At risk for malnutrition*
0-7	:	*Malnourished*

Appendix II.

BRADEN SCALE FOR PREDICTING PRESSURE ULCER RISK

Patient's Name_____

Evaluator:_____

Date of Assessment_____

					Score
SENSORY PERCEPTION Ability to respond meaningfully to pressure-related discomfort	**1. Completely Limited** Unresponsive (does not moan, flinch or grasp) to painful stimuli, due to diminished level of consciousness or sedation **OR** Limited ability to feel pain all over most of body	**2. Very limited** Respond only to painful stimuli. Cannot communicate discomfort except by moaning or restlessness **OR** Has a sensory impairment which limits the ability to feel pain or discomfort over ½ of body	**3. Slightly Limited** Responds to verbal commands, but cannot or the need to be turned. **OR** Has some sensory impairment which limits the ability to feel pain or discomfort in 1 to 2 extremities.	**4. No impairment** Responds to verbal commands. Has no sensory deficit which would limit ability to feel or voice pain or discomfort.	
MOISTURE Degree to which skin is exposed to moisture	**1. Constantly Moist** Skin is kept moist almost constantly by perspiration, urine etc. Dampness is detected every time patient is moved or turned.	**2. Very Moist** Skin is often, but not always moist. Line must be changed at least once a shift	**3. Occasionally Moist** Skin is occasionally moist, requiring An extra linen change approximately once a day	**4. Rarely Moist** Skin is usually dry, line only requires changing at routine intervals	
ACTIVITY Degree of physical activity	**1. Bedfast** Confined to bed	**2. Chairfast** Ability to walk severally limited or non-existent. Cannot bear own weight and/or	**3. Walks Occasionally** Walks occasionally during the day, but for very short distances, with or	**4. Walks Frequently** Walks outside room at least twice a day and inside room at least once every two	

EVIDENCE - BASED PROTOCOL

Braden Scale Cont.

		must be assisted into chair or wheelchair	without assistance. Spends majority of each shift in bed or chair	hours during waking hours	
MOBILITY Ability to change and control body position	**1. Completely immobile** Does not make even slight changes in body or extremity position without assistance	**2. Very Limited** Makes occasional slight changes in body or extremity position but unable to make frequent or significant changes independently	**3. Slightly Limited** Makes frequent though slight changes in body or extremity position independently	**4. No Limitation** Makes major and frequent changes in position without assistance	
NUTRITION Usual food intake	**1. Very Poor** Never eats complete meal. Rarely eats more than ½ of any food offered. Eats 2 servings or less protein (meat or dairy products) per day. Takes fluid poorly. Does not take a liquid dietary supplement. OR Is NPO and/or maintained on clear liquids or IV's for more than 5 days	**2. Probably inadequate** Rarely eats a complete meal and generally eats only about ½ of any food offered. Protein intake includes only 3 serving of meat or dairy products per day. Occasionally will take a dietary supplement. OR Receives less than optimum amount of liquid diet or tube feeding	**3. Adequate** Eats over half of most meals. Eats a total of 4 servings of protein (meat, dairy product) per day. Occasionally will refuse a meal, but will usually take a supplement when offered OR Is on a tube feeding or TPN regimen which probably meets most of nutritional needs	**4. Excellent** Eats most of every meal. Never refuses a meal. Usually eats a total of 4 or more servings of meat and dairy products. Occasionally eats between meals. Does not require supplementation.	

EVIDENCE - BASED PROTOCOL

FRICTION & SHEAR	1. Problem Requires moderate to maximum assistance in moving. Complete lifting without sliding against sheets is impossible. Frequently slides down in bed or chair, requiring frequent repositioning with maximum assistance. Spasticity, contractures or agitation leads to almost constant friction	2. Potential Problem Moves feebly or requires minimum assistance. During a move, skin probably slides to some extent against sheets, chair, restraints or other devices. Maintains relatively good position in chair or bed most of the time but occasionally slides down		3. No apparent Problem Moves in bed and in chair independently and has sufficient muscle strength to lift up completely during move. Maintains good position in bed or chair.	

TOTAL SCORE

Key

Braden Score:

15-18	:	*Mild risk*
13-14	:	*Moderate risk*
10-12	:	*High risk*
9 and below	:	*Very high risk*

References

1. Braden B. J; Blanchard, S. (2007): Risk Assessment in Pressure ulcer Prevention. In Krasner DL, Rodeheaver GT, Sibbald RG. *Chronic Wound Care: A clinical Source Book for Healthcare Professionals, Fourth Edition* 2007. Wayne, PA Health Management Publications, Inc. pp593-608.

2. Clay M. (2010): Skin Assessment in dark pigmented skin: A challenge in pressure ulcer prevention. *Nursing Times;* 106, 30. Available at www.allbusiness.com. Retrieved 10/10/2010.

3. Fowler, E. Scot-Williams, S., McGuire, J.B. (2008): Practice recommendations for preventing heel pressure ulcers. *Ostomy Wound Management, 54 (10), 42-48, 50-52, 54-57.*

4. National Pressure Ulcer Advisory Panel and European Pressure Ulcer Advisory panel (2009). *Prevention and Treatment of Pressure Ulcer: Clinical Practice Guideline.* Washington D.C. National Pressure Ulcer Advisory Panel.

5. Wounds, Ostomy and Continence Nurses Society. (WOCN) 2010: *Guideline for Prevention and Management of Pressure Ulcers.* Mount Laurel, NJ 08054.

6. Scemons D, Elston D (2009): *Nurse to Nurse Wound Care: Expert Interventions.* USA, McGraw Hill.

7. VanGilder, C, Amlung S. Harrison P. & Meyer S. (2009): Result of the 2008-2009 International pressure ulcer prevalence survey and a 3-year acute care unit-specific analysis.
Ostomy Wound Management available @www.o-wm.com. Accessed 4/2/11

This Evidence Based Practice guideline is developed by Rose Ekama Ilesanmi, a PhD Student in the Department of Nursing University of Ibadan, being part of her research project on pressure ulcer prevention.

It is meant to provide a guide to nurses for preventing pressure ulcers and preserve the skin integrity of hospitalized patients.

PRINTS @ 07026838173

Appendix VII

Pictures during Workshop sessions

The researcher and her supervisor during one of the sections

Lecture in progress

Cross section of participants

The Researcher and participants